WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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VOL. II.—No. 84.] SATURDAY, OCTOBER 25, 1890. [PRICE ONE PENNY.

For Fig. 3, see p. 512.

Fig. 4.—Laurel-Ribbon: narrow.

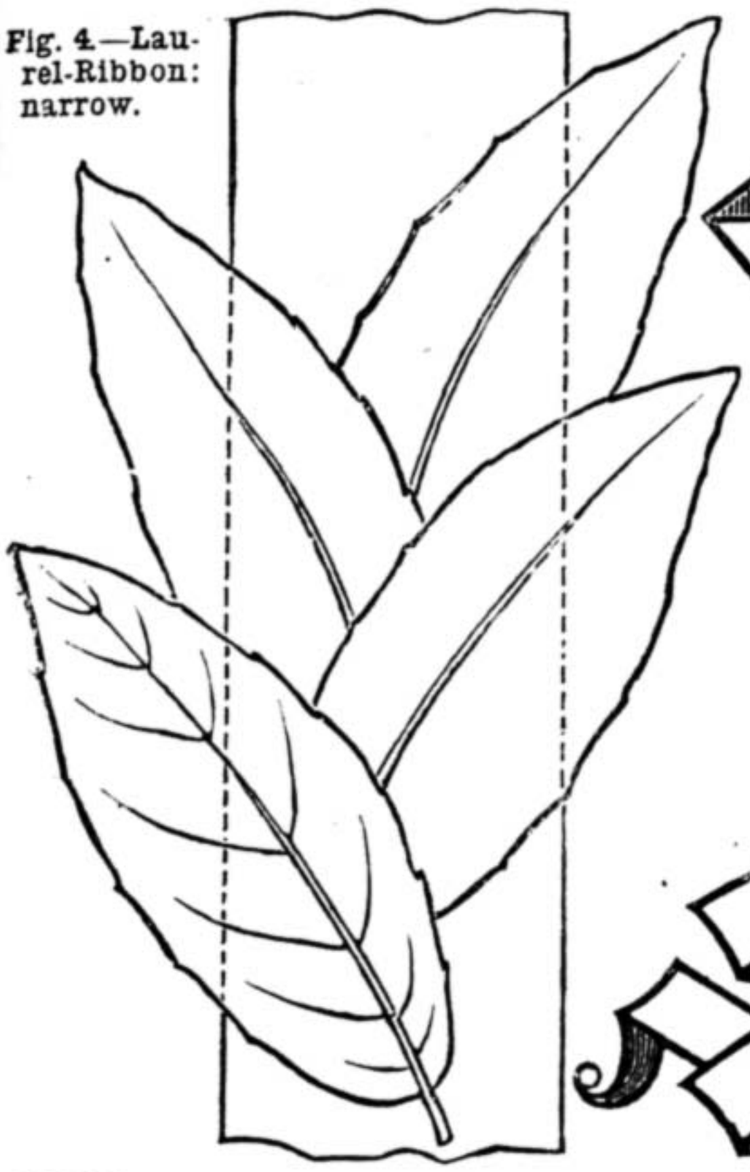

Fig. 9.—Diaper.

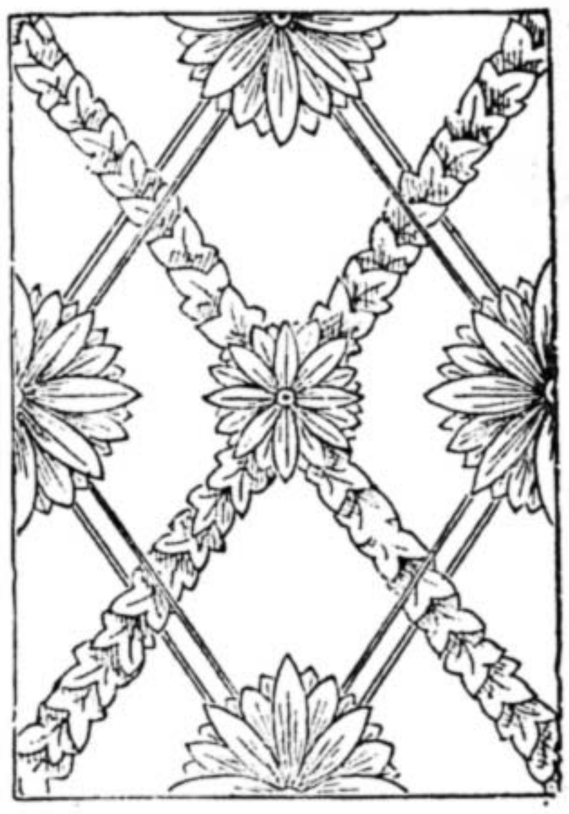

Fig. 7.—Motto Scroll for Depressed Arch.

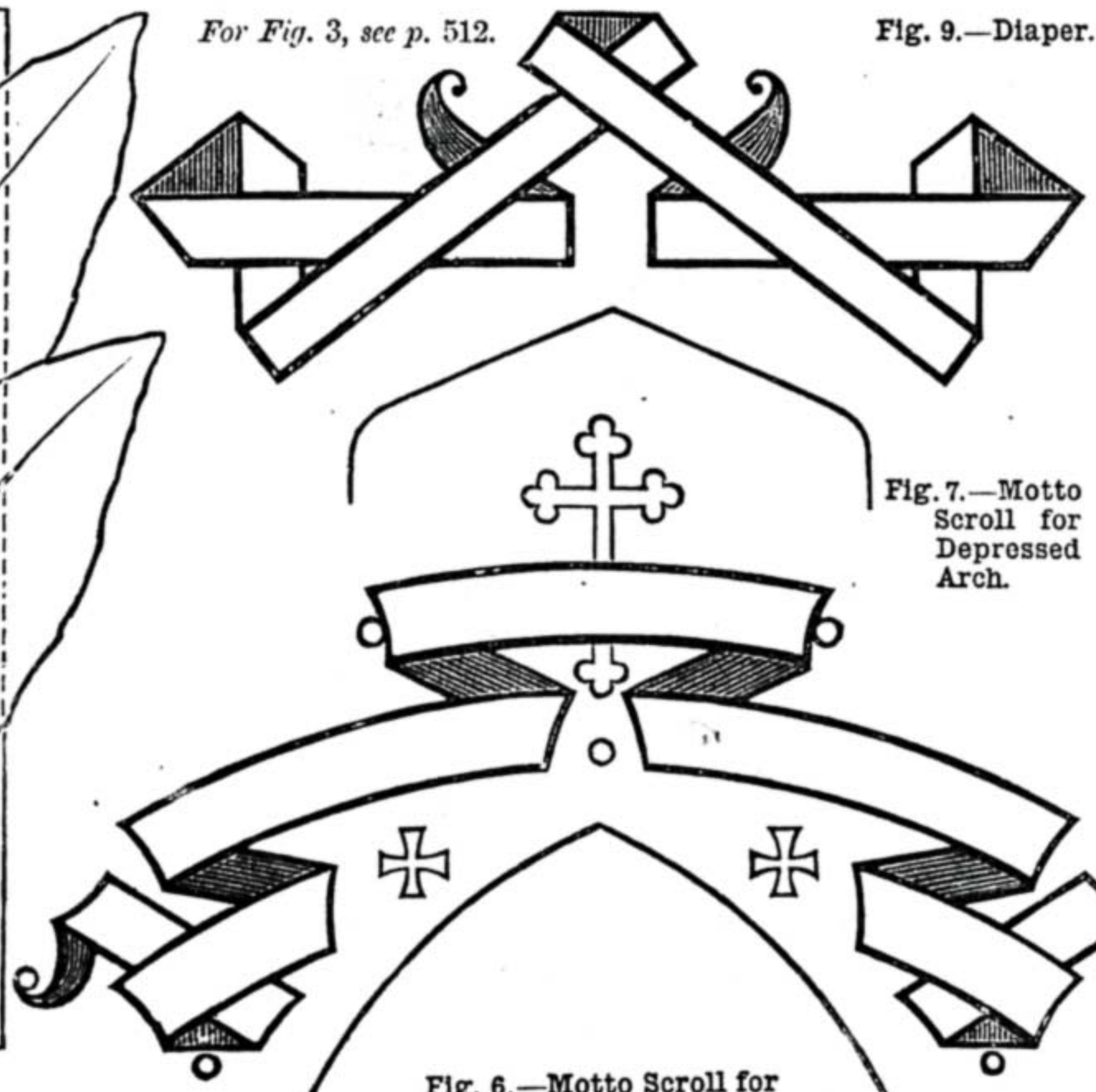

Fig. 6.—Motto Scroll for Pointed Arch.

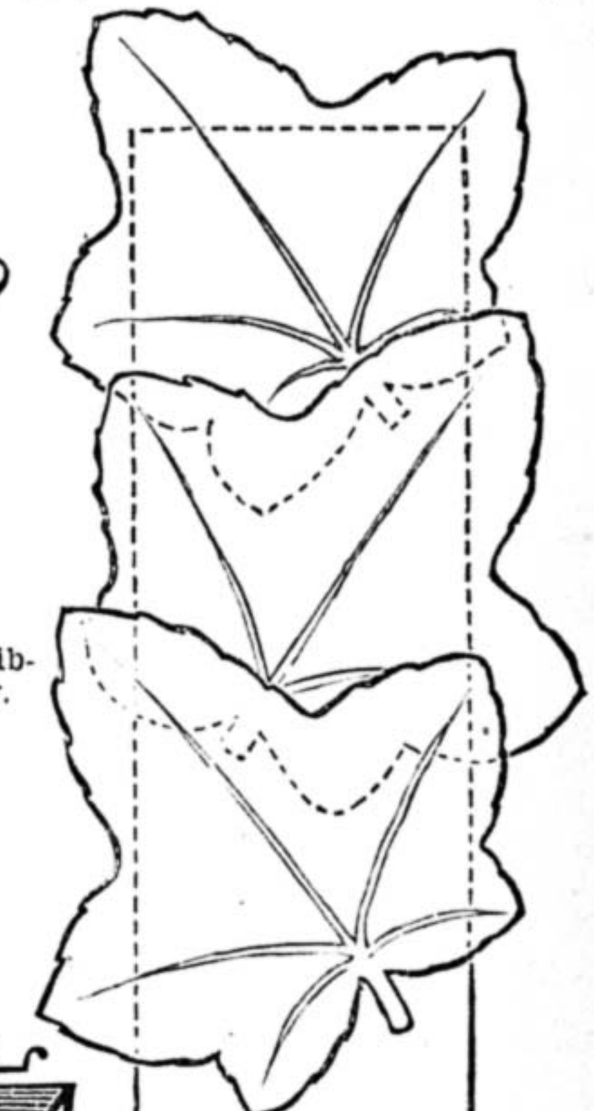

Fig. 2.—Ivy-Ribbon: narrow.

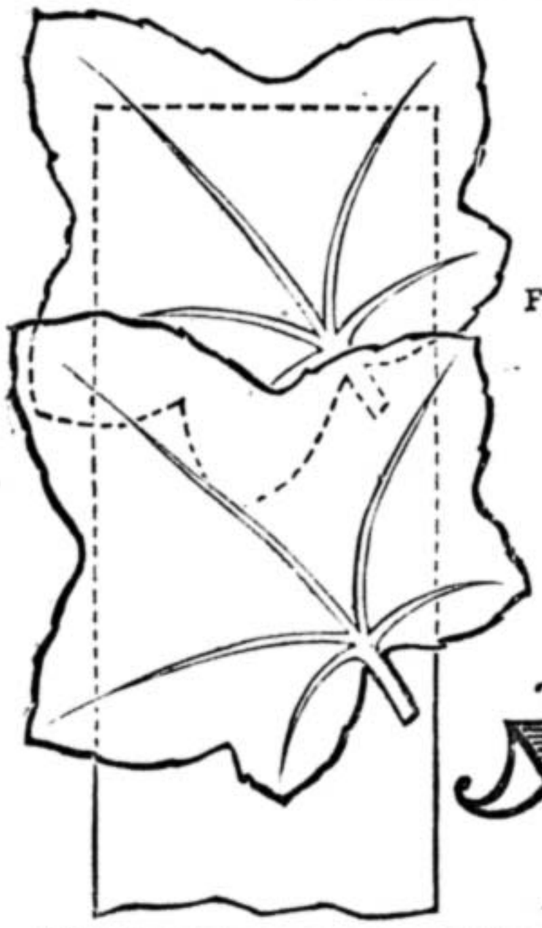

Fig. 1.—Ivy-Ribbon: narrow.

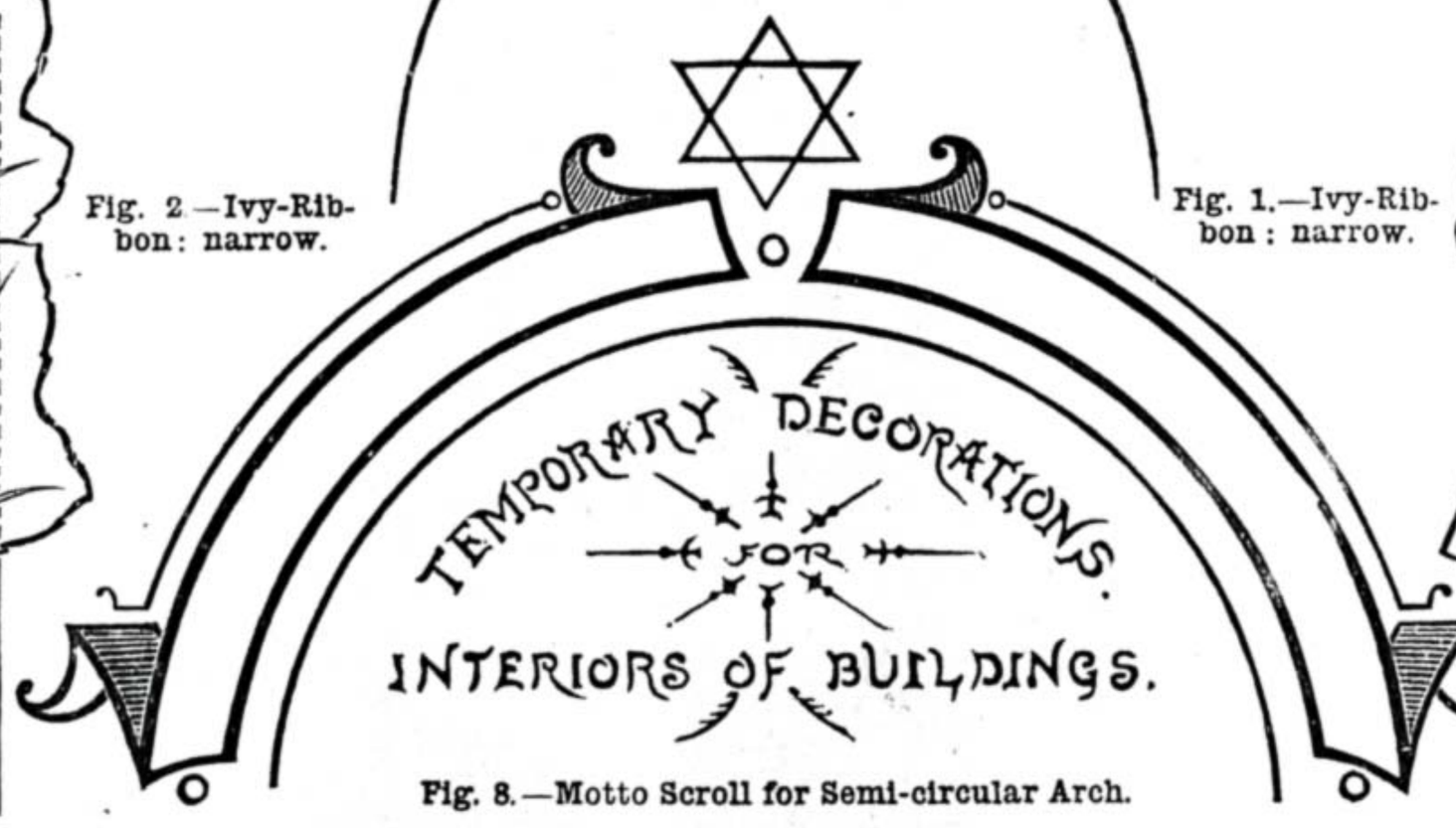

Fig. 8.—Motto Scroll for Semi-circular Arch.

Fig. 5.—Letters for Texts or Mottoes.

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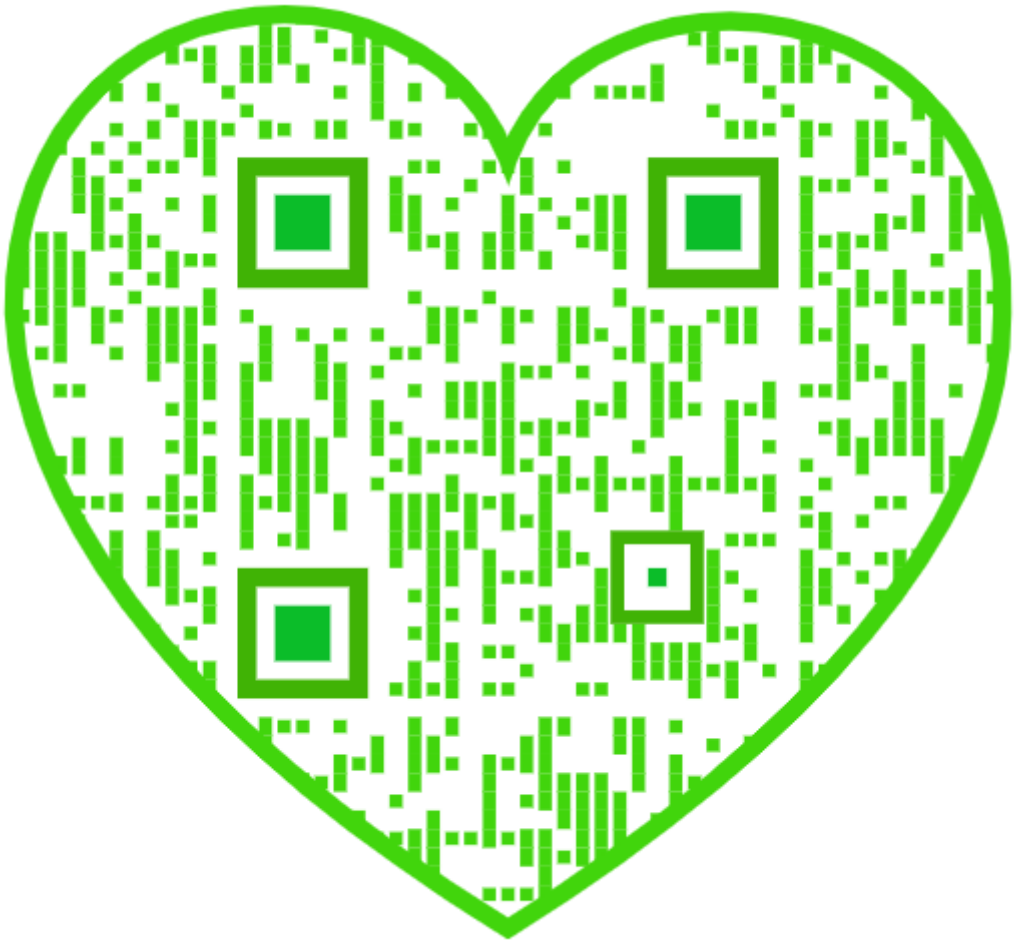

TEMPORARY DECORATIONS FOR THE INTERIORS OF BUILDINGS.

BY ARTHUR YORKE.

ORGANISING THE WORK AND WORKERS—PREPARING MATERIALS—IVY-RIBBONS—FESTOONS—TEXTS AND MOTTOES—CHURCH DECORATION FOR CHRISTMAS—THE CHANCEL—WINDOW DRESSING—DIAPERING WALLS—DODGES FOR FIXING DECORATIONS WITHOUT DRIVING NAILS—DECORATING A ROOF—DIAPERING WINDOWS—NATURAL DECORATION—DECORATING CHURCHES OR CHAPELS FOR HARVEST FESTIVALS—SEASONABLE MATERIALS—THE "SEVEN YEARS OF PLENTY."

INTERIOR decorations of a temporary kind, whether for a religious or social occasion, are generally carried out by the united labours of a number of unpaid workers; and before entering upon practical details it will be well to say a word as to the way in which to organise such a band of volunteers. Its members will, as a rule, work with zeal, and among them will be more or less artistic talent; but if inexperienced, they may set about their task without sufficient system. It is too much the custom in decorating for one person to undertake one part and another a second part, independently of each other, and the effect of their work, however well it may be done, will not be harmonious.

The better way is first of all to choose the person best qualified for the office, and let him undertake the general direction. It will be his duty to arrange a scheme of decoration for the whole, to allot to the different members of his party such work as they are best qualified to do, and to see that his arrangements are properly carried out. By doing this, much waste of time and labour, and often much unpleasant feeling, may be avoided.

When the chief decorator begins to organise his staff of workers, he will find, if the building is a large one, that it will not be wise to dispense altogether with paid assistance. His staple material will always be evergreens, though in a smaller proportion in summer than in winter, and these will be contributed by a number of givers. It is found most satisfactory to employ a gardener to cut and collect these, for he will know how to cut the trees so as to benefit rather than to injure them. Evergreens do not quickly wither, and it is better to get the supply together before beginning work, as the amount of material must usually influence the plan to be adopted.

Supposing, then, that the building is large, and that there will be an amount of ladder as well as of hammer-work. On a ladder an amateur workman is rarely at home, so a couple of handy young carpenters should be engaged. Their trade knowledge will make them useful in more ways than one. Beside their neater methods of putting up the work, they will, if they are the right sort of men, be able almost at a glance to tell the approximate measurement of lengths and spaces, and be invaluable in setting out diapers and similar matters. Failing carpenters, housepainters are found the most useful men for the work.

A large proportion of "lady-power" will always be available, and this will be advantageously employed in preparing festoons, ivy-ribbons, and such-like stock forms of decoration; and it will be well that all should know distinctly what they have to do, and that "surprises" in the way of decorations will not be desired.

Something must be said about the stock forms just mentioned, and first of the *ivy-ribbon*, as it is a matter of first utility. Figs. 1 and 2 show narrow ribbons, the leaves being stitched on paper 2 in. wide. Either the more graceful wild tree ivy can be used or the garden ivy; the former looks best when the ribbon is to be placed near to the eye, but it is not always to be procured in quantity, like the common garden ivy, and with the larger leaves of the latter the ribbon is more quickly made. Fig. 1 is the more ordinary arrangement; Fig. 2 may be taken as a variety; and another variety is seen in Fig. 3, which makes a broader ribbon. Yet another form may be suggested as looking best for bordering the fronts of window-sills, in which the bases of the leaves are all to one (the lower) side, and the points all set to go straight upwards on the higher side. The leaves are sewn upon strips of brown paper, which can be pasted or sewn together to bring them to any length required; but in ordinary the ribbons are made in lengths of about a yard, which are fixed up with black tacks, and as the leaves overlap at the joinings, they form an (apparently) unbroken line. Laurel leaves are also made into ribbons; they are not so pretty as ivy, but suffice for some positions. If placed in single file, they are too monotonous, and are better arranged something in the manner shown in Fig. 4, or when made into a broader ribbon with a central leaf, like the ivy (Fig. 3). Laurel-ribbon is quickly made, and looks very well at some height above the eye. These ribbons may always be made in quantity: their uses are, as we shall see, many; they can be cut anywhere beneath the overlapping leaves. In common with other stock evergreen decorations, they should be kept in a cellar or other cool place till wanted. The illustrations of these ribbons are drawn to about half the actual size.

To make *festoons*, the approved way is to drive a hook into a wall at a convenient height, to make a loop in the end of your cord (which should be slightly thicker than ordinary clothes-line), and to hitch the loop to the hook, laying the cord out down the room. The binder employs a child or two to break off little sprigs of various evergreens for him, of which he makes up a little bunch, or besom, in his hand, and binds the ends of the stalks to the cord with binding wire. The leafy ends of the second besom hide the tying on of the first, and so on till the length is finished. For festoons near to the eye, evergreens with smaller leaves are to be preferred to laurels; yew is graceful and good for the purpose; but laurels look well when placed high up. If festoons can conveniently be made to the required length, it is well to make them so, as to make a good joining is troublesome. Wire is the best binding, but in default of it, twine must serve.

Texts or *Mottoes*—as the building to be decorated may happen to be sacred or secular—are tolerably sure to be wanted. In these the practice of forming the characters in leaves, rice, etc., is not to be commended; such characters are apt to be ill-formed as letters, and not ornamental as decorative matters. Nor are grounds for such characters in red flannel or calico altogether in good taste, as such things are apt to suggest mean associations. Paper will be found not only the most easily managed material for both letters and ground, but also the best in appearance. White cartridge is most suited for the ground, and for the characters nothing tells more effectively than that sold as "purple royal," which is familiar to most people in the wrappers of needles. For distinctness at a distance, neither gold nor red are to be compared to it. It is well to paste the sheets of cartridge together into such lengths as are convenient for the ladder-men to fix up; it will be found that lengths of more than 6 ft. are not easily managed. The letters are pasted or gummed to the ground before putting up. Letters tacked up separately are exposed to a certain danger, which it is well to avoid. The writer remembers a room decorated for amateur theatricals, where the dropping down of a final "e" gave the audience a new reading of Shakespeare—"All the World's a Stag!" If the wall is one into which nails may be driven, the lengths of motto are readily tacked up; if not, they have to be fixed on boards and hung. Just below the roof it is almost always possible to put in hooks from which to suspend.

The characters chosen should be so far ornamental as to be pleasing to the eye, but still so far simple as to be read with ease. Letters in which the decorative element is carried to excess, and which are thus rendered unintelligible, violate one of the first laws of beauty, which is fitness, and are offensive. No pleasure is derived from inscriptions such as those surrounding the Houses of Parliament, which convey no more meaning to the ordinary reader than do the hieroglyphics on Cleopatra's Needle. Fig. 5 shows two or three effective but perfectly readable forms of letters.

The letters used should also be large. In decoration designed by ladies this part of the work not unfrequently fails through the characters being too small and finikin, and the same fault is common in those printed and sold. For a room 50 ft. long 6 in. letters are none too high: they should be of a size to be read from every part. No capitals rising much above the general level are to be admitted; as there will always be a border, they make the margin look unequal in width. Nor are gold or red initials to be commended, for at a distance they will not stand out in equal strength with the purple; unless the following plan is adopted—as well as the red or gold letter, cut out another a trifle larger in purple, and stick the former on the latter so as to leave a half-inch border all round. This will not materially interfere with the margin, and will make the letter (or word, if a whole word is so distinguished) as legible as its fellows.

Punctuation, in its ordinary acceptation, is not attempted in mottoes, but space-marks of the nature of those in Fig. 5, in red or gilt paper, should separate all the words. They are valuable as giving colour; and, as there shown, a Maltese cross, quatrefoil, etc., should precede and finish each motto.

To avoid waste of time in shaping letters, it is found best first to draw carefully so much of the alphabet as will be needed on cardboard, and to cut it out. A whole alphabet will never be needed, as some of the letters will serve equally well for others; as, for instance, E, which by omitting the lower limb will serve equally well for F, and so on. A boy or girl can then lay these cardboard letters on the purple royal, and mark round them with a blacklead pencil, and a lady can cut out.

Figs. 6, 7, and 8 are intended to show how the (paper) scrolls for texts and mottoes may be manipulated so as to fill any desired space. Fig. 6 is made to surmount a pointed arch. The shaded portions—the back of the scroll—are supposed to be of coloured paper, the dark lines and the

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border of ivy-ribbon; and the crosses and small devices are of paper, over which leaves are sewn in the same way as in ivy-ribbon. Fig. 7 is a scroll suited to a depressed arch. Fig. 8 is made to follow the lines of a semi-circular arch. The thin line above it represents a narrow line of ivy-ribbon, whilst the bordering of the scroll is a broad one.

Turning, as we can now do, to actual decoration, it may be observed that to lay down any cut-and-dried scheme would be of little good, since in practice so much must depend on the capabilities of the room to be decorated. The more useful course will be to indicate in a general way the ornaments that are most appropriate to certain situations, and to tell of the means at our command.

We will first consider church decoration at Christmas-tide. In a church the most important part—that to which all eyes naturally turn—is the chancel; it is therefore the part to be first thought of and most highly ornamented. In the chancel the most important part is the communion table, but as that will have its own proper ornaments, flowers, etc., it need not be considered here. Above it custom seems to have decided that a text is necessary, and this will be bordered with ivy-ribbon.

If the church possesses ecclesiastical banners, good of their kind, or if such are to be procured, they can be used effectively in dressing the east window; not by clustering them in a bunch in the middle, as is sometimes done, but by setting them, singly, each in the centre of a light. In small churches the lights are commonly three, and these may well be occupied by banners bearing the symbols of the three Christian graces, Faith, Hope, and Charity—the last, of course, taking the place of honour. If the lights are four, the symbols of the four Evangelists may well ornament them; or if five, the Agnus Dei may well come in the centre between those symbols.

A very rich effect is to be gained by diapering walls. This ornamentation is perhaps too elaborate to be carried out in all parts of a church, and may therefore well be reserved for the chancel. Diagonal lines of ivy-ribbon are fixed crossing each other at such angles as will result in a series of well-shaped lozenges (see Fig. 9). For these lines a narrow ivy-ribbon will be used, and at each intersection a boss will be added. Fig. 9 has really rather been designed as a diaper for the walls of secular buildings; in it the middle of each lozenge is filled with a larger boss, as at A, and these are connected by lines of red tape, so as to form a sort of double diaper. The ivy-ribbon also does not run, as we are now supposing, continuously from bottom to top. Nevertheless, this figure serves sufficiently well to illustrate what is being said.

During their season, which tallies with that of harvest festivals, dahlia blossoms are admirable as bosses. These, however, are not to be had at Christmas, but chrysanthemum flowers of the larger kinds often may be. Failing real flowers, paper ones must take their place, and these, though less pleasing in sentiment, will pass muster in practice. The way of making them will be explained in due course. The ivy-ribbon is best fixed up with tacks, and a needle-point through each boss will secure it. Wherever ivy-ribbons intersect or form angles, bosses are, it should be remembered, desirable.

Diapering requires a horizontal line of ribbon to finish it at top and bottom, also a perpendicular one at each corner angle; and wherever a break occurs in the walls, as at the sedilia, piscina, etc., a bordering of ribbon will likewise be required. If, however, arches with dripstones occur, or if, as is not unfrequently the case, a dripstone string-course runs round the walls, a festoon laid along the dripstone looks better. A wider ribbon will be necessary for all the borders, etc., than for the lines of the diaper.

The method of setting out a diaper is shown in Fig. 10. Along the horizontal lines which form the top and bottom of the space to be diapered, measure off and mark a series of dots (say with chalk), dividing it into equal spaces; then with a chalked string mark off the diagonal lines (as in Fig. 10), starting from the left-hand corner dot, and going to such a dot at bottom as will give the required slant. The object is to get such lozenges as are pleasing to the eye, not too square nor yet too pointed. In the diagram it will be seen that the above line is drawn to the eighth bottom dot. The same size of lozenge must be kept throughout, so that point may meet point and half meet half at the corners, or the effect will be ruined. Fig. 11 shows a more exact way of setting out the diaper with horizontal lines, which may be preferred by those who have abundance of time.

Mention was made just above of *needle points*. These broken needles, sold by the pound for such purposes, are most useful for fixing up the lighter decorations, as they do not, as do nails, make holes which disfigure the walls. As sold by the ironmonger, it will generally be found, however, that they are unmanageably long (except for fixing bosses). In woodwork it is usual to break off the superfluous length *after driving*, but this does not answer in plaster. It is better therefore to set a boy to shorten a quantity to ½ or ¾ in. with pliers. In many churches—and sometimes in other buildings—the driving of nails into the walls is strongly objected to, and there will always be some places where nails *cannot* be driven. As we go on, various dodges for fixing decorations without nails will be given.

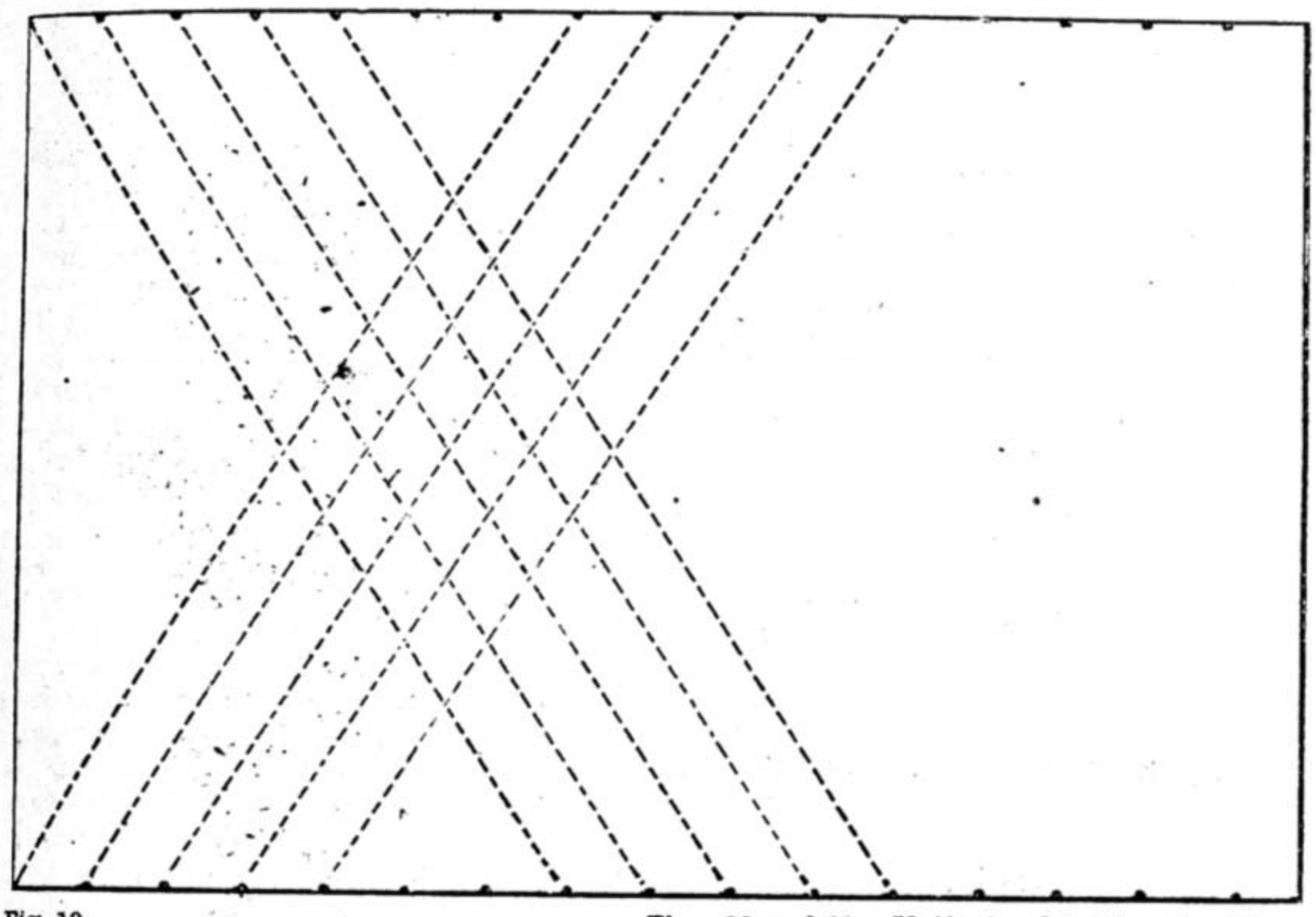

Fig. 10.

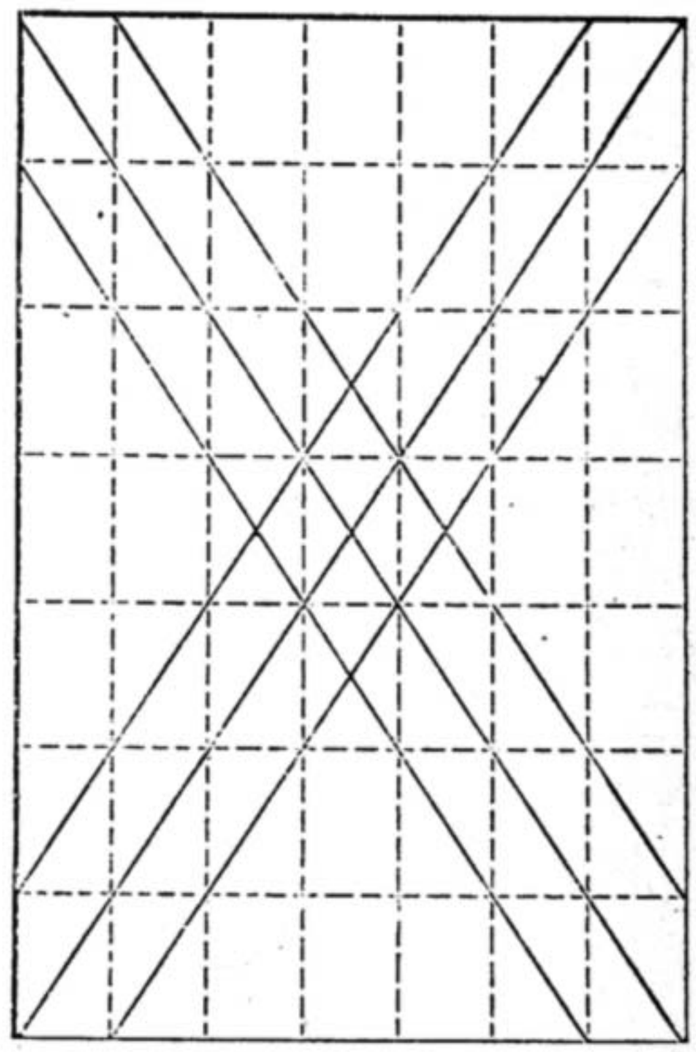

Fig. 11.

Figs. 10 and 11.—Methods of Setting Out Diapers.

Before absolutely leaving the chancel, we may find occasion for making use of one of these dodges. It frequently happens that the chancel arch is supported on pillars attached to the walls, with which we cannot deal as with ordinary *detached* pillars. Over the dripstone (if there is one) of the chancel arch on the nave side we shall fix a festoon, and over this will probably be a text (see Figs. 6 and 8). On the capital will be a wreath of evergreens, but this cannot be fixed by a wire surrounding it as if it were a detached cap, yet we shall probably have to fix it without using nails. To do this, we must get a wooden hoop of suitable size, cut an opening in it, and bind our wreath of evergreens upon the hoop. The spring of the hoop will hold it firmly, and other places will be found where this use of a cut hoop will come in handy. In the angle formed below the cap by the shaft of the pillar a "rat's tail" of festoon, say a quarter of the height of the shaft, might be made to hang down.

The caps of chancel arches are conspicuous places, and the wreaths that surround them are good for the display of colour. The

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berried holly, the red Christmas cherry, the iris pod showing its rows of bright scarlet seeds, will tell well among the evergreens crowning these caps.

The supply of fresh flowers will rarely be large at Christmas: it is therefore well to dry *immortelles* (everlasting flowers) of different kinds and colours for use in decoration. Fresh natural flowers need tucking into their places at the last moment, and renewing daily; faded flowers are the very reverse of decorative.

At this place may be mentioned a dodge useful when a carved stone pulpit, a font, or any similar matter, has to be decorated. Into anything of this kind nailing would be out of the question, but by wedging pieces of cork into the angles of the stonework or into the hollows of the carving, and driving tacks into them, the decorations may be kept in their places. Or another way (on carving) is by rolling up slips of paper and inserting the rolls into the hollows—their tendency to unrol themselves keeps them tight. The decorations are fastened to these by pins or needle points. If the rolls are so placed as to show, they should be of the same colour as the stone, etc.

Nor, in dealing with detached pillars, is there any need for nails. A wire tightened above the cap secures the wreath placed there. The shaft beneath will probably be ornamented with a festoon wound spirally round it. The top end of this can sometimes be suspended from the wire already fixed; when it cannot, a second wire, which will be practically invisible, can be tightened for that purpose round the bottom of the cap. Another wire surrounding the base may hold the lower end, and, unless the shaft be a tall one, any further support will scarcely be needed; but if it should be, it is easy to add a middle band of wire. In most churches there is, however, woodwork about the bases of the columns into which a small nail may be driven to secure the bottom of the festoon, and behind which its ends will be hidden.

In churches where the nave is very high or very short the roof will scarcely be considered as a subject for decoration; where it is otherwise, much may be done with festoons suspended from the timbers in the centre, and falling to the corbels, where will be a bunch of evergreens, below which the festoon will end, as shown in Fig. 12, in a "rat's tail." A succession of such festoons, as seen from either end of the church, has a bowery and pleasing effect. Fig. 12 may serve to give some idea of the manner of carrying out this kind of decoration, but, as will be seen from the arrangement of the timbers, this drawing is rather intended to illustrate the decoration of a schoolroom roof, which will be spoken of farther on.

In addition to its use in bordering texts on the walls of the nave or aisles, ivy-ribbon may be found

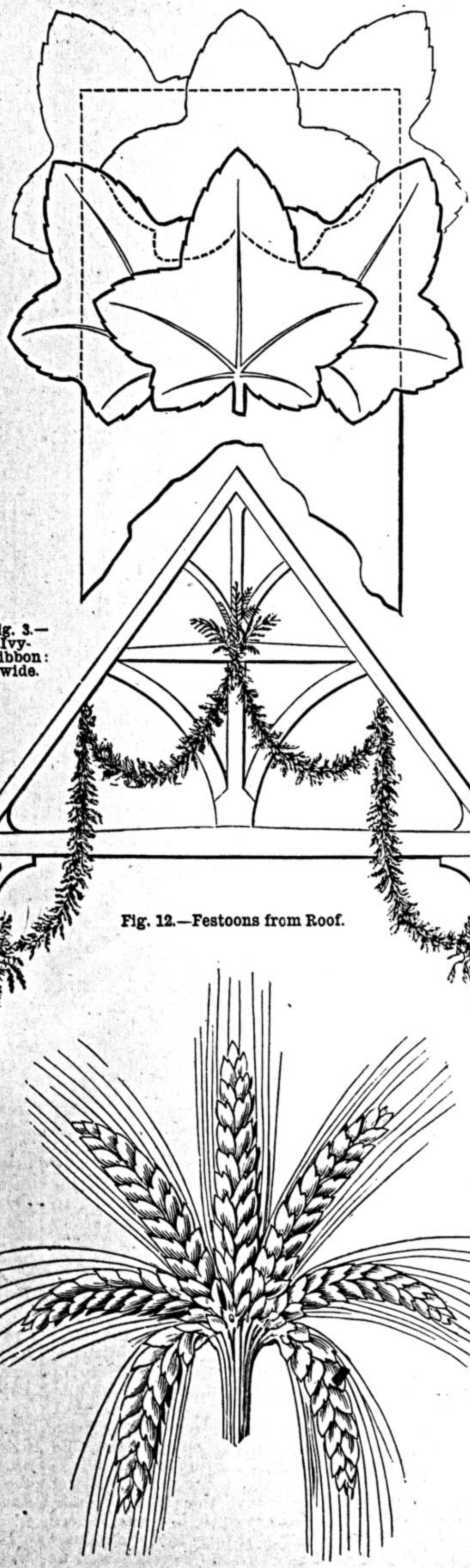

Fig. 3.—Ivy-Ribbon: wide.

Fig. 12.—Festoons from Roof.

Fig. 13.—Emblematic Device: Seven Years of Plenty.

of value in the body of the church in forming symbols or monograms. They are readily made from it, and especially if they are composed of moderately straight lines and tacked direct on the walls.

Mention may also be made here of a method of diapering windows which will be novel to many readers, and may be used in churches, though it is really better adapted to chapels where the panes are larger and stained glass absent; it is also, perhaps, best suited for harvest festivals, as the most effective leaf to employ is the symbolic vine leaf. The plan is to gum or paste a leaf in the middle of each pane, the leaves being selected as to size, and arranged orderly. It should be noted that if freshly gathered, the leaves have a tendency to curl; it is therefore found better to press them flat and partly to dry them.

Among minor materials for decoration, moss should not be overlooked. Its chief use is to form a flat green ground, good for setting off any brightly coloured ornaments or natural objects which may be placed upon it. Sloping window-sills thus covered are good for the display of devices in flowers, berries, etc. If the sill slopes much, the moss may be kept from slipping by a lath along its front edge, covered with ivy-ribbon; if it only slopes slightly, the ivy-ribbon on stout paper tacked along will alone suffice. When speaking of the making of ivy-ribbon, mention was made of the most proper variety for this purpose.

Of what is called "Natural Decoration" nothing has yet been said, nor indeed is there much which can be said on that subject. In this, all must depend on the surface to be covered, the fitness of the material, and, most of all, on the individual taste of the decorator. The small and beautiful tree ivy is the thing to be used. The object is so to arrange it as to suggest the idea of its having grown where placed. It needs judicious joinings, and can then be made to twine round objects and spread itself over surfaces wherever its presence will be most pleasing to the eye. No other decoration equals it in beauty when well done. It may well be carried over the panels of a carved stone pulpit, and of course the cork or paper dodges above mentioned will then have to be called into requisition. Natural decoration is fixed in place with needle points and an occasional tack.

For the *Harvest Festival* many Nonconformist chapels as well as churches are decorated, and hints for this occasion will therefore be of wider use. Of the suggestions already made, the greater number will be as useful at this time as at Christmas. To be sure, at harvest we shall have to depend less on evergreens; in fact, we have then an overflowing abundance of decorative materials, the difficulty lying rather in selecting than procuring. We have the different kinds of grain, all beautiful and

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appropriate: maize, less common, but highly decorative when it is to be had; the showy flowers of later summer, such as the dahlia and sunflower; and fruits, which have been so much over-used on these occasions that a word of caution seems to be needed with regard to them. Of grapes there is little danger of getting too many, but other fruits will be better used sparingly. Still less is it consistent with good taste to drag in such edibles as turnips and carrots, and the furniture generally of a costermonger's barrow, as we too often see done. Some of the smaller and more richly coloured gourds are really decorative, and may well be used, but not so the huge and colourless vegetable marrows which we sometimes see brought in, and which suggest only mean ideas. The feathery branches of the asparagus, with their tiny scarlet berries, are not to be despised; nor are the bunches of the hop, both of which are most graceful in decoration: hops, however, like flowers, need to be added at the eleventh hour, as their leaves quickly fade. Cut ferns, beautiful as they are, have for the same reason to be avoided, or stuck in at the last moment. Among other useful materials are the feather-like tufts of the gigantic Pampas-grass, and the scarcely less elegant heads of our common native reeds; the heads of the smaller grasses—graceful and ornamental as they are—should be reserved for home decorations; in large buildings they are apt to look small and weak.

In these decorations the propriety of giving to wheat the first and most important place is obvious. Wheat is highly symbolic, and stands as the type of man's food. Perhaps the most correct decking of the communion table is with a miniature sheaf in its centre—the sheaf being, however, big enough to show what it is throughout the whole church—and on each side of it a basket or vase-shaped dish of fruit, in which the grape, also highly symbolic, should be conspicuous. In Nonconformist chapels the wheat and fruit might in like manner be displayed on the small communion or "ordinances" table commonly set in front of the pulpit or rostrum.

In those decorations which come nearest to the eye, the corn, fruit, flowers, and such-like seasonable matters, will doubtless chiefly be used; and at the same time more natural and less conventional ornament is properly looked for than at Christmas. Yet ivy-ribbons and festoons will still be wanted in considerable quantities if a really good effect is to be produced: to the former, however, dahlia bosses, and perhaps bunches of corn, will now be freely added, whilst in the festoons an occasional rosy-cheeked apple will not look amiss.

At this time there is also scope for displaying taste in flat devices in grain placed on moss for window-sills, panels, etc. The "Seven Years of Plenty" drawn at Fig. 13 is an example of such devices.

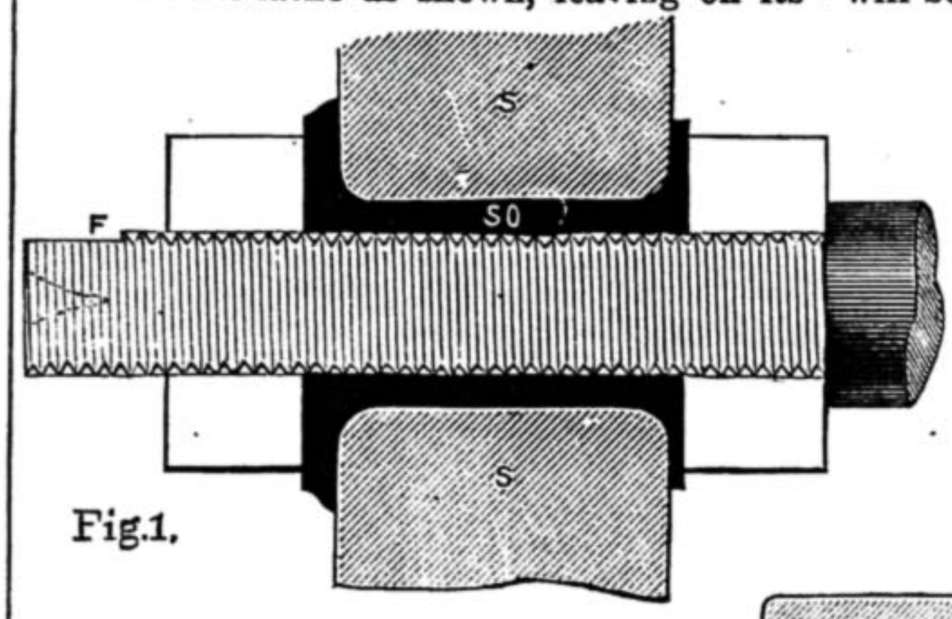
MODE OF FITTING GRINDSTONE AND CIRCULAR SAW TO LATHE.

BY GRADUATE.

THE sketches and description here following may be useful to readers of WORK who have a lathe, and who wish to fit thereto the two most important requisites for wood-workers—a grindstone and a circular saw. I have never seen any reference to the three plans described, and they may be useful to others, as they have been to me. The idea of the apparatus is a stout bar put in the lathe centres, a grindstone being mounted on the left hand and a circular saw on the right hand of it, a small and well-balanced carrier being placed on the extreme left for driving the whole appliance: the object in putting the stone and saw on the same shaft is to save delay in changing from one to the other.

The bar selected should be a good stout one, so that it will not "wobble" in the middle when running at a high speed, and must be truly centred. Each end should then be turned down to ½ or ⅝ in. diameter, the right end for about 2 in., and the left for about 3½ in.: these ends are then screwed, and nuts fitted to run easily upon them. The plan adopted for accurately centring the saw is shown in Fig. 2: the first nut is screwed well home, and then cut down in the lathe as shown, leaving on its right-hand side an edge about ¼ in. broad: the first washer and the saw then have their holes enlarged till they will just slip on to this edge, the saw particularly being a sound fit. The second washer, slightly hollowed in the centre (as shown), follows, and then the second nut: when the latter is screwed up the saw is bound to run true. If two or three saws are used—as they should be for different classes of work—each one should be mounted on a soft-wood chuck in the lathe, and have its centre hole enlarged *exactly* to the size of the nut where it is turned down, and then each one will be absolutely and immediately centred when put in position on the shaft.

All this work can be done by a jobbing mechanic for a few shillings: the grindstone can be fixed by the amateur himself, as follows:—Turn a peg of wood a trifle less than the diameter of the screwed end of the shaft; fix this by a screw to a board, being careful that it is truly vertical, as shown in Fig. 3; put an ordinary elastic rubber band on the board, concentrically with the peg; lay the stone down as shown, and adjust it till its edge is as nearly as possible an even distance all round from the peg: finally, put some weights on the stone, and fill up the hole with melted solder. When this is cold, unscrew the board, knock the peg out, and twist the screwed end of the shaft through the hole, as shown in Fig. 1, with a nut on each side to hold the stone fast; the screw will cut for itself a shallow thread in the solder, and the stone can at any time be removed, with the certainty that it can be properly centred when it is put back. If desired, more than one stone, or buffing wheel, can be thus prepared for use on the same shaft, one after the other. For running between the centres of an ordinary lathe, the stone should not be more than 4 or 5 in. in diameter, otherwise its peripheral speed will be too fast.



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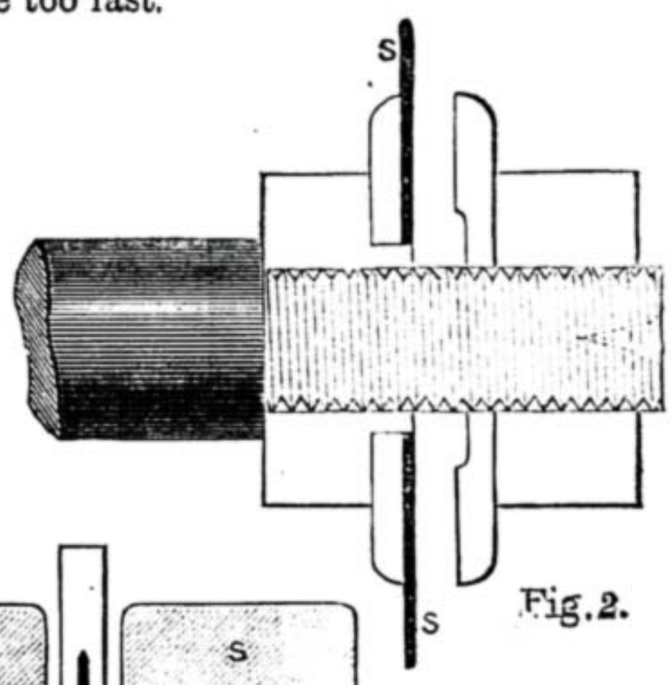


Fig. 2.

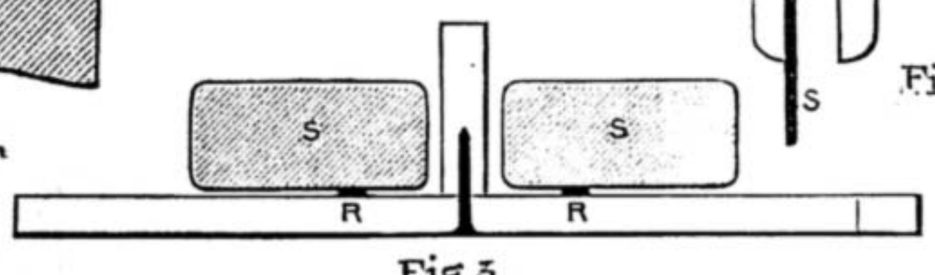
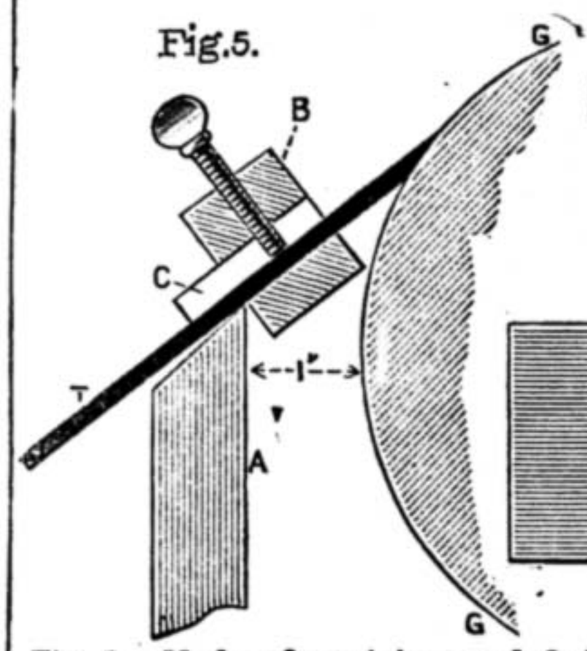


Fig. 3.

Fig. 5.



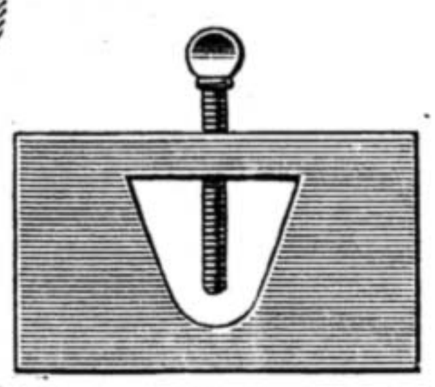


Fig. 6.

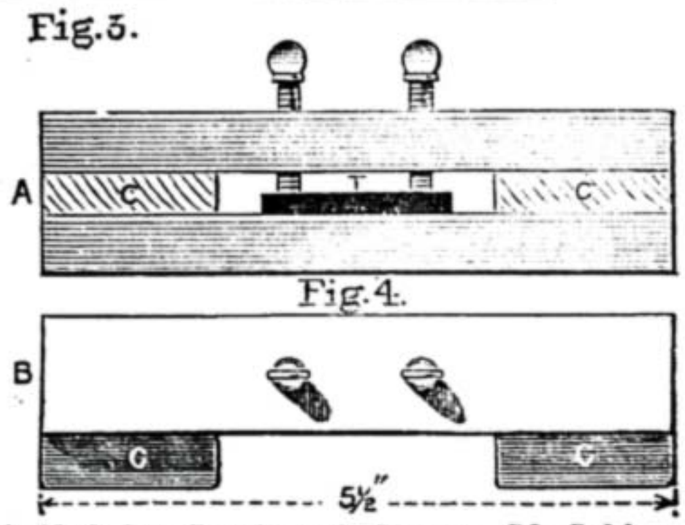


Fig. 4.

Fig. 1.—Mode of centring and fixing Grindstone—F, Flat filed for Carrier; S, Stone; SO, Solder. Fig. 2.—Mode of centring Saw—S, Saw. Fig. 3.—Mode of lining Hole in Stone with Solder—R, Indiarubber Ring; S, Stone. Fig. 4.—Tool-holder in Elevation (A) and Plan (B)—C, Slips between the two Strips of Wood that form Top and Bottom of Holder. Fig. 5.—Side View of Tool-holder (B), holding Tool (T), and resting on Slip of Hardwood (A) in front of Grindstone (G). Fig. 6.—Elevation of Tool-holder for Gouges.

Of course, a proper box must be fitted round the grindstone, and a can above, with a small tap, from which water drips on the stone. The front edge of the box should be about an inch from the stone, and a sharp edge of hardwood, about 8 or 9 in. long (A, Fig. 5), placed horizontally in front of it: upon this rides the tool-holder (B, Figs. 4 and 5), with which tools can be easily and expeditiously ground to the proper angle. The way of using this can be readily seen from Figs. 4, 5, and 6 (the latter shows the holder for gouges), some dimensions of which are shown in the drawings. The extent to which the tool should project beyond the holder can be found by actual trial, and when found, should be made a note of. I have never seen this appliance described, but for many years I have used it, and have found it invaluable in that important department of tool sharpening which amateurs so often neglect. I trust that these suggestions may be of use to some of the numerous readers of WORK.

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THE AUSTIN-LECLANCHÉ BATTERY.

BY H. E. AUSTIN.

ABOUT a year ago I fitted up a good 3 in. bell and battery from the information found in the articles in WORK entitled "Burglar Alarms," but I found that the battery was not powerful enough to bring out the full tone of the bell; so I determined to fit up if possible a cell that should give a strong current, have a low internal resistance, and at the same time be more compact, portable, and less liable to damage than the ordinary Leclanché cell. My first thought was to do away with the usual porous earthenware jar, and substitute in its place something thinner and more unbreakable; and in so doing to bring the carbon plate nearer the zinc, thus decreasing the internal resistance of the cell.

I proposed also to employ two carbon plates instead of a single one as in the original, and to have one on each side of the zinc, which is in the form of a plate instead of a rod; thus there is clearly double the negative surface exposed, for in the old form only one side of the plate is practically brought into action; therefore, in the former case, there is a much larger current given out.

Taking all these considerations in mind, I proceeded to fit up a cell in the following manner:—

A stoneware jar is procured of the required size—about 5 in. × 3 in. will do for a small size; this will take about the same sized carbon as the small Leclanché, viz., about 6 in. × 1½ in., including the lead cap of the carbon.

The carbon plates can be bought with a lead cap and terminal ready for use, of the above-mentioned size, for about 8d. each; and the zinc plate for about 5d., ready amalgamated. But it is not advisable to rely upon the amalgamation of the zinc when purchased, so it is better to do it over again, for in keeping they get scratched and cut. We now come to the substitute for the porous jar. I have used for the present about ten or fifteen thicknesses of tissue paper. My manner of procedure is this:—The zinc plate is laid upon a sheet of white tissue paper (which has previously been folded into four), and wrapped round with this about three times and the remaining end fastened down with some waterproof cement or glue, (cobbler's wax does very well); but both of these must be used very sparingly, as they prevent the exciting liquid from gaining free access to the zinc.

The prepared plate with a wire soldered to the top is set upright in the middle of the jar, and a capped carbon plate on either side of it, each about half an inch from the zinc, and closely packed with a mixture of equal parts of peroxide of manganese and gas carbon (each broken to the size of peas and washed to free it from dust), to within half an inch of the top of the jar.

This charge will now want a seal of pitch run over the top of the carbon, and manganese to keep the contents in place; when this is cool, two holes will have to be made in the top of the seal to admit the exciting liquid, and also to allow the gases formed in the working of the cell to freely escape. The lead heads of the carbons and the zinc plate that projects through the seal should be coated with tar, enamel, or Chatterton's compound to prevent them being attacked and corroded away by the fumes. The solution used in this cell is the ordinary sal-ammoniac dissolved in warm water (rain water is the best) until it is saturated, and afterwards diluted with about one-fourth of its bulk of plain water. This should be poured into the cell through the holes that have been made in the seal until it is full, after which it is fit for use.

This cell gives a strong current for a much longer time than the ordinary Leclanché (I myself having rang a bell for one hour without any perceptible decrease in the tone); it is more portable and compact, and has a higher E.M.F. and a lower internal resistance than the above-mentioned cell. Added to these facts are the advantages that it is easily made up by anyone, and also that it is cheaper; the price of the cell described in this paper when completed is about 2s. 8d., an ordinary Leclanché of the same size costing 3s. 6d., the latter not giving such a powerful current as the former.

When recharging this form it is better to fill it with water two or three times to cleanse it of the old solution. The management, situation, and working are precisely similar to the description given in WORK for the maintenance of burglar alarms.

I conclude by testifying that it works most satisfactorily, and hope that readers of WORK may benefit by fitting up an Austin-Leclanché battery.

MORE HINTS ON ORDINARY ETCHING.

BY R. G. NAISH.

IN a former paper I dwelt on a method of etching on steel or iron by a simple process, and I doubt not, ere these few lines are read, many have practised the craft to an advantage. I supplement a few more remarks, which doubtless will be found of service.

Probably a little difficulty was entertained at the idea of etching on anything presenting a convex surface. A glance at Fig. 1 will show how this may be achieved. After putting on your ground and marking the letters you wish to etch, put a border round them with some plastic acid-resisting substance. Tallow will answer the purpose very well. Let the border be of sufficient depth to hold enough acid to etch properly without running over the sides. Sometimes when the acid is poured on it will permeate through a little crevice which has escaped notice. When this occurs, plaster on some more tallow to stop the leakage. Here one might see the necessity of covering your article with "ground" freely, not confining it merely to the place where the etching is done, but spreading it where it may act as a protection in the event of any unpremeditated occurrence.

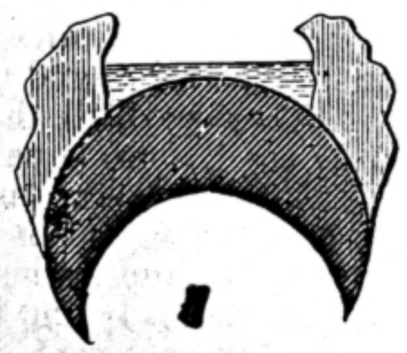

Fig. 1.—Mode of Etching on Convex Surface: Acid backed up with Tallow.

In very small round articles—some tools, for instance, where calibre is very diminutive—this method of "backing up" the acid with tallow is unnecessary. They should be coated with ground all round, and the acid applied when the characters are in an inverted position—facing the floor. The attraction of the metal will be found quite sufficient to retain enough acid to etch with. This mode requires a little attention during the process of biting in, when your characters are rather large in proportion to the circumference of the article, because you will only be able to etch part of them properly at one time, and the article have to be tilted occasionally for the other part to receive the benefit of the acid. This will entail a little patience on the part of the operative, though perhaps not altogether an uninteresting procedure. If considered a difficulty worthy of being avoided, your article may be fixed in the vice or placed

Fig. 2.—Etching in Relief: Letters marked ready for Biting.

on two supports, and just looked after occasionally.

Another method of treating your characters is leaving them in relief, with the surrounding parts corroded away to a limited distance, which should embody some kind of ornamentation or other. The design in this instance, when etched, stands out in bold relief, and presents a striking contrast to the corroded surrounding metal. This style may be preferable to some, especially those handy with the brush, the manipulation of which constitutes the principal agent.

The process will be readily understood by those who have attempted the other method; but to make all clear, I will briefly relate the main points. The letters, or whatever you wish to etch, must be painted on with a fine brush. Put the Japan black on as thick as you can, for the thicker it is the less chance of any detriment arising. Then enclose in the border, and when thoroughly dry, bite away the exposed metal with the nitric acid. For any kind of work where a little art is incorporated with the subject, I would advise only a weak bite with the acid. I mention this because one might applicate this method in various ways. Scrolls of other ornate work look very effective when treated in this manner, and plenty of material, such as cutlery, scissors, etc., may be always found to try your ability on. To the workmen who wish to etch of moderate depth, it may be worth noting that etching in this manner will necessitate ample use of acid, as the metal to corrode is considerably more than in the former method.

Fig. 2 represents some letters on part of a chisel; the dark part shows the Japan black laid on as it should be prior to putting on the acid. When the etching is completed and the ground washed off, a reversion of what you see shown will be the result, the light parts being dark, and the dark parts bright.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

GRAINING MAPLE AND PITCH-PINE.

IN the preceding paper upon graining furniture, the imitations of maple and pitch-pine woods were particularly suggested as suitable for that purpose; and since both of these woods are also very popular for graining on woodwork of dwelling-houses, we shall now consider the best methods of imitating them.

The botanical aspect of this subject, the genus, tribe, and order to which the various woods imitated belong, is a matter I have intentionally avoided dwelling upon in these

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papers, not from any disparaging notion of the usefulness of this beautiful branch of science, but with a view to keeping within the simple limits of the practical imitative work, and of best occupying my space to the learner's advantage. The maple tree, however, is far from being so familiar to most of us as the oak, hence it will be as well to indicate a few particulars of this wood.

The Varieties of Maple number considerably over fifty, and these are distributed throughout the temperate regions of both the eastern and western hemispheres. The only species which is a native of our own country is the *common maple;* this grows only as a small tree, and to some considerable extent as a hedge-shrub. The *sycamore maple*, or *great maple*, is, however, naturalised in Britain, and grows to much larger and more massive dimensions. This latter species, commonly termed the sycamore, is extensively used by turners and musical-instrument makers, and is probably familiar to many readers in the form of a violin back, or such like. Notwithstanding the foliage and flower of all varieties of maple are of a highly ornamental nature, and such as will provide the decorator with an admirable *motif* for decorative purposes, the *sugar maple* from the North American continent ranks far before those above mentioned for beauty of grain and serviceability for our modern civilised requirements. As its name implies, this species of maple is useful in a two-fold manner—as a source of obtaining sugar, and, particularly, under the designation of "Birds-eye maple," in providing the cabinet-maker with a fine grained and beautifully marked wood, equally useful for both solid work or veneering.

Bird's-eye Maple—for under this name we will consider it—is therefore that particular variety which we purpose imitating, and the chief characteristics of which are a very delicate, irregular mottle upon a cream "ground," interspersed with clusters of, and "straggling," small knots, and, entwining and encircling these latter, a very fine and graceful overgrain. The general colour-effect of maple wood is of a decided cream, which, under the French-polishing process, usually develops into a rich and golden tone. Although the natural colour of the mottle is usually similar to that of the general fibre or "ground" colour, a slightly cooler tone of mottle is usually adopted in graining the imitation, instead of simply a darker glaze of the same golden ground. The little knots—or "bird's eyes," as they are suggestively termed, so much depth and transparency do they each present—and the fine overgrain are marked by a slight redness of colour, and this is a point further to our advantage in graining the imitation.

Maple is a wood we seldom find used for household furniture in this country, although in the United States and those parts of America to which this species is indigenous it is much more favoured; doubtless the higher cost of the maple over our equally serviceable but less beautiful native woods of birch, ash, etc., somewhat accounts for this. Its imitation, however, is almost as popular with us as oak, and, indeed, for many years it was the most favoured imitation for the drawing-room woodwork of middle-class houses. As it is my intention to consider the purely decorative aspect of grained imitations in a subsequent and separate paper, we may at once proceed to the imitative process.

The Tools required for Maple Graining by the distemper process are, generally, the same as those we previously used for imitating pollard oak, viz., thick hog-hair mottlers, a thin, stiff ditto, sable-pencil overgrainer, the badger, a sable pencil, and, besides these, the maple-eye "dotter" and "shader." The brushes are shown on page 40, Vol. II., at Figs. 5, 18, 8, 16, 21, 10, and 11 respectively. A clean piece of wash-leather and a piece of soft sponge are further indispensable items to this and all other water-grained imitations. When graining the woodwork of a room of any importance, several different sizes in width of thick mottlers and sable overgrainers are very necessary, the former for making mottle of varying size upon the various surfaces and the mouldings especially, and the latter to allow us to accommodate our overgrain more naturally to the different surfaces of the panels and stiles. A thick mottler of some 3 in. wide is the most useful, and this, with one an inch wide, will usually suffice; the best size for sable overgrainer is from 1½ in. to 2 in. wide, and the same width, or smaller, of thin, stiff mottlers is recommended.

The importance of cleanliness in working, and of purity of colour and materials, for every description of graining cannot be over-rated, and with imitations of so light and delicate a wood as maple or satinwood these conditions apply particularly. Brushes, vessels, pigments, and work should be free from any suspicion of grit, grease, or dust; otherwise, however excellent the imitation may be, no good finish and effect is possible.

The Ground and Graining Colours for Maple require care and judgment in preparing. The ground should be quite opaque, and of a clean, creamy white. The genuine white-lead, slightly stained with the best Oxford or Italian ochre (in oil), makes an excellent ground. Some experienced grainers prefer to give the ground a very faint pink tint with vermilion, and others prefer a ground slightly stained with the two pigments combined. These are points of personal election, for so long as the paint is kept from the two extremes of chalky-white, on the one hand, and decided red or yellow tints of ground on the other, the finished colour is not very materially affected. The *spreading* of the ground requires, however, the finest brush-work; for should the work be left for the grainer with coarse, streaky brush markings, the graining colour and varnish will bring them out very unnaturally and unpleasantly. The colours, or pigments, used for the graining vary considerably more with grainers than does the tint of grounds. Vandyke brown is the most convenient, and gives good results alone; combined with a little burnt sienna warmer tones are obtained, whilst we may occasionally see good executant skill displayed with very cool, black shades of mottling. In reviewing the general effect of these varying tones, the black-looking appears the least "happy" and natural, whilst decidedly warm mottling, on the other hand, detracts from the colour of the overgrain. The Vandyke is a good medium pigment, but, personally, I prefer a mixture of the *finest* burnt umber, ground in water, combined with a little *raw Terra-di-sienna*. This mixture, as also the finest raw umber, gives, to the writer's mind, the nearest natural colour of the mottle, as well as the most pleasing general colour. In graining all woods we usually aim at the colour of the real wood when French-polished, and observation will show that, as before mentioned, a decided golden tint characterises polished bird's-eye maple. For home or ordinary work, however, a Vandyke brown wash is admirable; and this having been prepared to the desired depth with weak beer, we rub it over the practice-board with the large mottler, and then proceed to imitate the wood in the following manner.

In Graining Bird's-eye Maple, the proper manipulation of and mastery over the mottler is a matter that will exercise the learner's patience for some little time, and he must not be discouraged at the probably unnatural results of first attempts. The action of this brush is to take out parts of the graining colour, and leave the remaining portion in the irregular, but not *erratic*-looking, form of soft shadows or mottle. Let us now assume that the panel has been evenly spread with the graining colour, using the mottler or a large tool, and that here and there a few slightly *darker* touches of the same colour have been put in towards the centre of the panel with the sponge. The badger is now taken up and the work "softened." By this "softening" the dark spots are blended into the general tone, and the colour is sometimes brushed from the centre towards the outer edges of the panel, thus getting away from the monotony of a perfectly "flat" looking mottle. On taking the large mottler in the right hand, it will be found that the fingers can grasp the hair—"dig into it," I might term it—at the base, and so break up the straight line of the bristle ends. When the mottler is held at nearly right angles to the panel, this action will cause the top of it to wipe out an irregular, undulating portion, instead of a straight, square shape. We therefore work a large panel by wiping successive pieces out of the softened colour with the top of the brush, leaving larger mottle at the sides, and working to smaller portions near the centre and "heart" of the plank. To get a natural mottle of maple, a double action of the brush is often used, the second one cutting across the first at a very obtuse angle; hence it is best to first mottle from top to bottom of a panel, across its entire width—in a slanting direction, and with due regard to the size of mottle, and then, after softening with the badger, to repeat the effect, but slanting the brush diagonally, as before mentioned, *across* the previous mottle.

Whenever mottling is done, we require a vessel of clean water at hand in which to rinse and dip the brush; the superfluous water, which would otherwise run down and spoil the "softened" colour, is then pressed out against the leather, and in maple graining this is of much importance.

Mottling a panel takes longer, and, indeed, is much more difficult, to describe than to execute, for quickness must be worked for and acquired not only to spread, soften, and properly mottle a panel before it dries, but to further add the following work, viz., the knots or bird's-eyes, and the bright lights thereto. Although interspersed somewhat irregularly all over a panel, the knots mostly occur near the top edge of the portions of mottle. A single knot will show us upon examination to be a nearly circular dark marking with a bright spot in the centre, and they occur in clusters and patches all over the panel, with "ones and twos" scattered between. To make the eyes there are several methods, the most convenient being the "dotter" before mentioned—a small camel-hair tool made hollow in the centre, and which, when pressed against the colour and then on to

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the panel, prints the dark shape, or knot. This tool is a rather modern notion, for in the old days the worker would either twist a little piece of cloth or leather into the desired shape, and fix it to a wooden holder; use a sable pencil; or, for the commonest work, just dab the tips of his fingers on the panel, this latter getting results quite outrageous to look upon. The "eyes" should be put in with the "warm" colour, made with a little burnt sienna dissolved in beer and slightly softened in colour with Vandyke or black. Although by these methods we form the dark parts of the knot, we do not get the bright centre thereby, and when proper imitation is intended this light spot must be taken out with the leather covered over a pointed stick or the pencil handle. The small reflective lights must also be wiped out, and these will be found to spring from the eyes outwards across the mottle, coming to a point against the knots and softening off

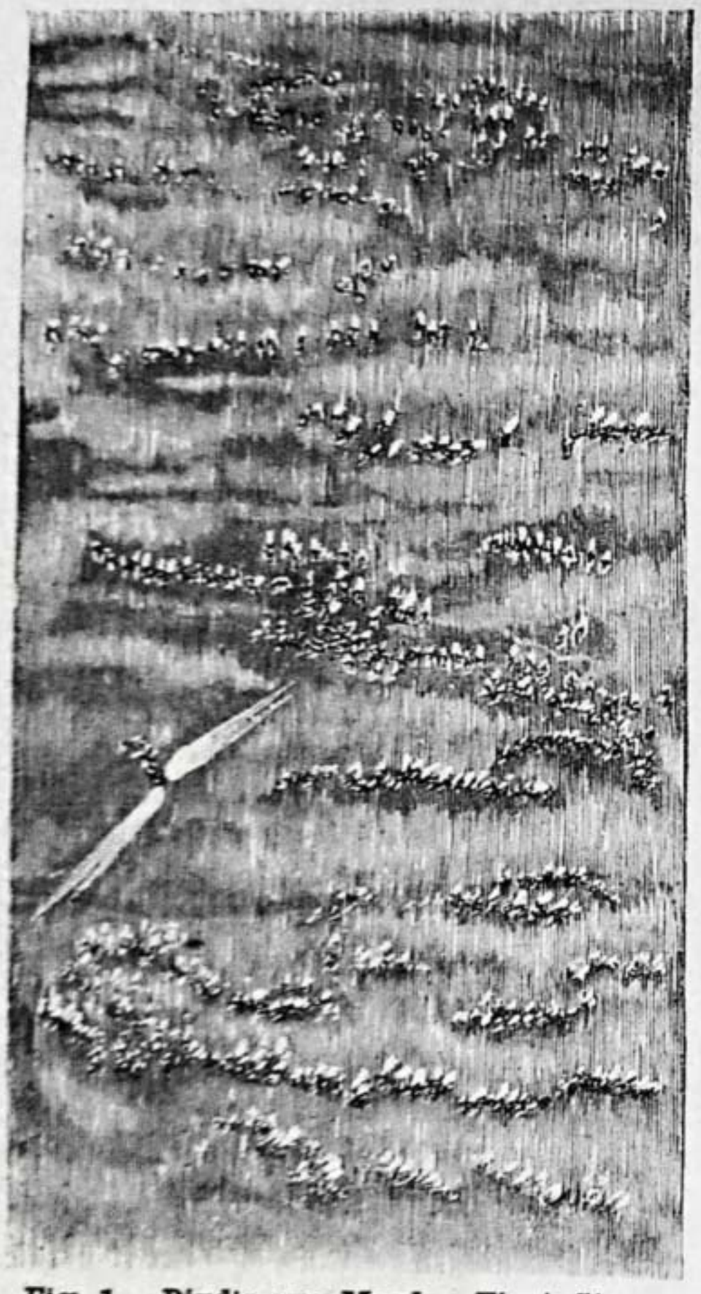

Fig. 1.—Bird's-eye Maple: First Stage.

like the overgrain of sap, only of a smaller size. All the imitative portion so far described should be done without stoppage and before the colour dries, when it is possible. For the best work, and in hot weather, we are often unable to get beyond the spreading, mottling, and softening ere the water evaporates. In such a case we leave the panel to get quite dry, proceeding with other portions, and then wash out the large mottler in clean water, and wet the panel by drawing the brush carefully down it. The use of beer is not necessary for binding, except with black, but it makes the colour safe for this wetting, and also keeps the work from drying so rapidly, therefore I advise using it. When the panel has been wetted over, the knots and reflective lights may be put in, and the work left as in Fig. 1. The final overgrain should also be put upon the panel in its wet condition, and this delicate work is "softened" outwards as it is executed. It is put in with the burnt sienna colour and the sable pencil, working from and around the knots in irregular, concentric lines from the heart and in the manner illustrated in

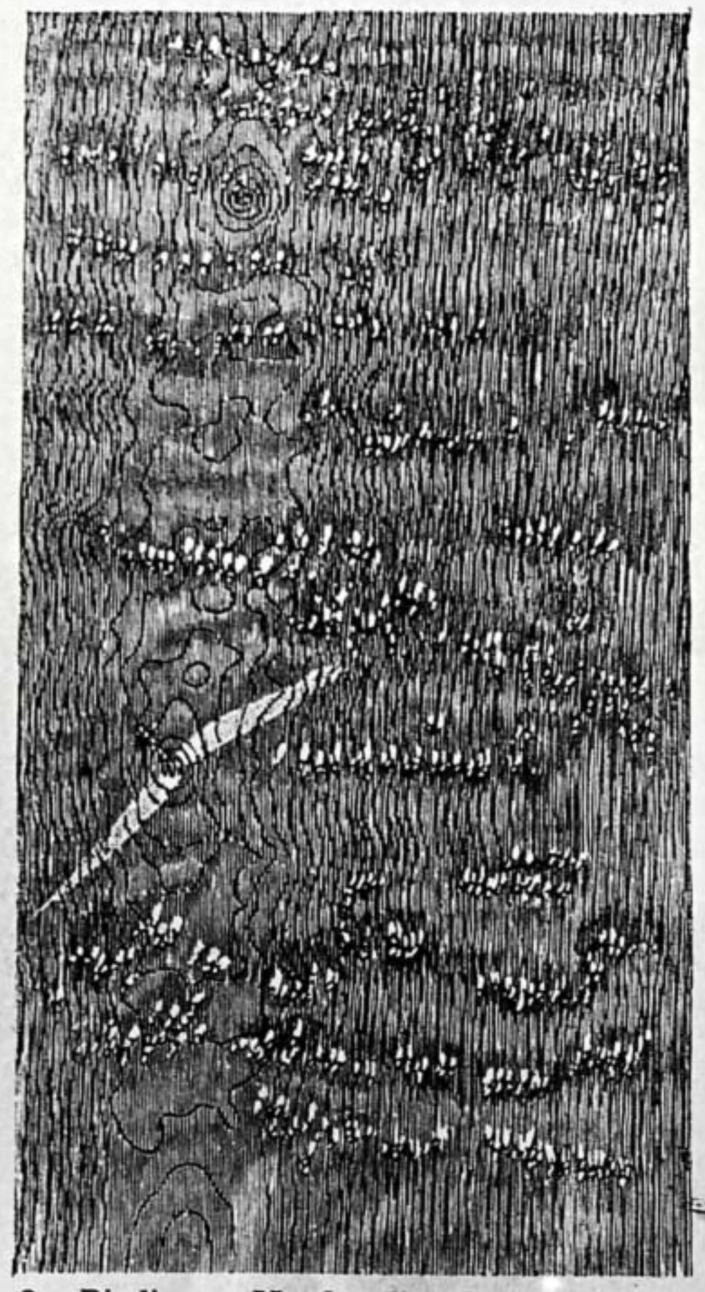

Fig. 2.—Bird's-eye Maple after Overgraining, etc.

Fig. 2. When the central heart-grain has been pencilled from top to bottom of the panel, the sable overgrainer completes the work on the sides, following the formation of the pencil-work, and gradually working into regular straight markings. A few delicate touches of red shading under the little knots are then put in with the "shader" or pencil, and softened downwards, both these and the overgrain being kept *unobtrusive* in tone and depth of colour. The work is then ready for varnishing, and for which the lightest copal varnish is necessary, otherwise the "ageing" of the latter will soon destroy the delicacy of the imitation.

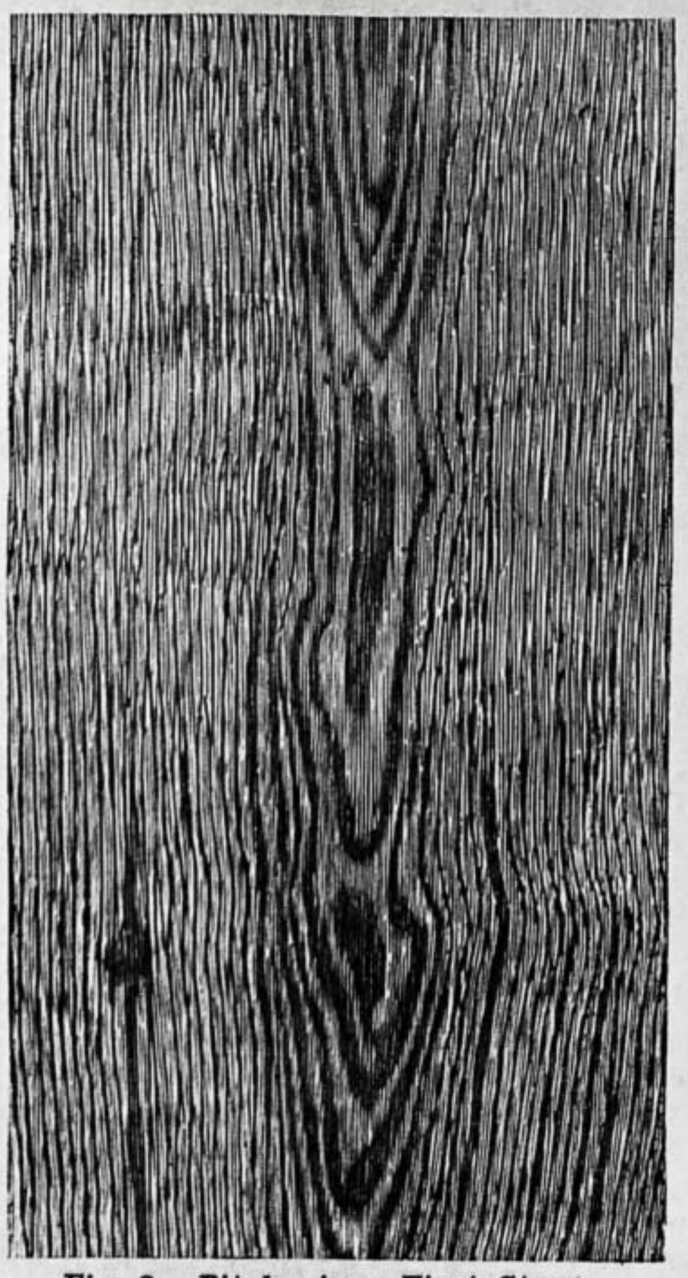

Fig. 3.—Pitch-pine: First Stage.

Graining Maple in Oil is a process that has little to commend it, unless the imitation has to be worked on surfaces exposed to all weathers. The ground is prepared with the best brush-work, and the graining colour, made from the finest pigments ground in oil, requires the same working qualities as properly mixed graining colour. The usual methods of mottling in oil are either by working a damp wash-leather over the panel (as described in my previous paper for pollard oak), or by drawing down the face of the panel the hard edge of a strip of buff-leather, which takes out the colour in irregular patches, but hardly with a natural-looking result. Any worker who has followed me so far with success, and is able to exccute maple in water, will scarcely need more than these few lines to put him in the right track; continuous practice and imitation of the genuine wood will then complete his training.

Graining Pitch-pine is a subject that will

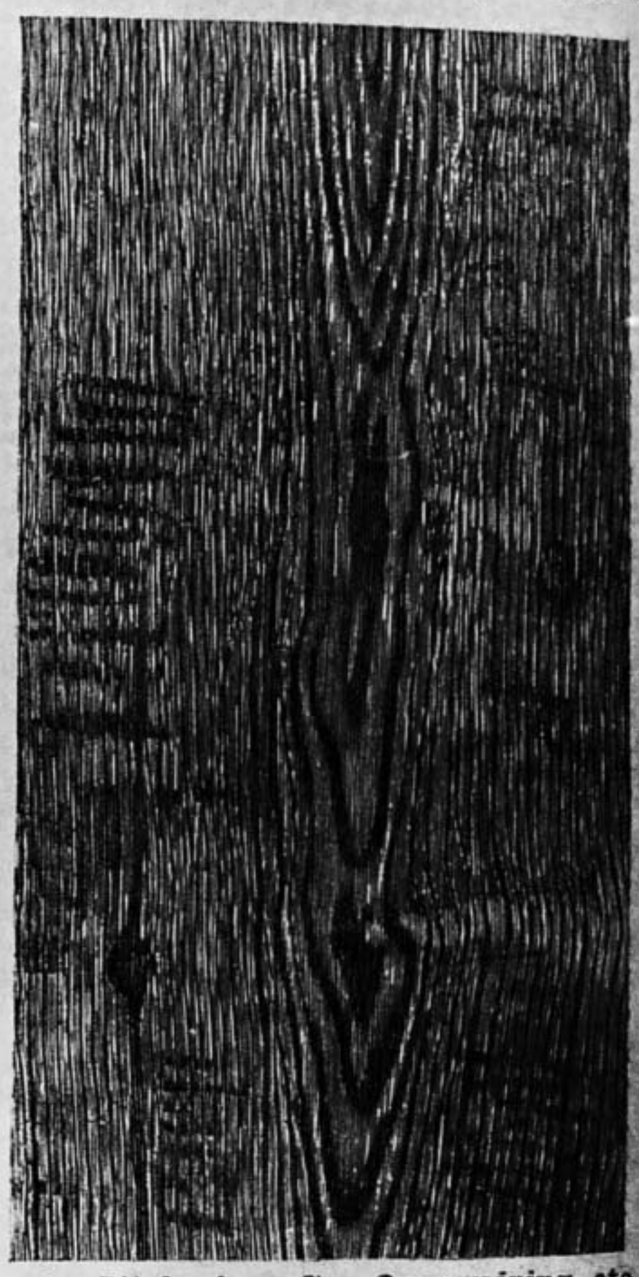

Fig. 4.—Pitch-pine after Overgraining, etc.

well repay study and practice. There are two good ways of imitating it, the first, according to my illustrations, Figs. 3 and 4, being executed in water-colour, and the other method that of graining the heart in oil, just as the sap of oak is wiped out with thumb-piece and rag, and then using open, leather or cork, combs for the plain outer grain. Although any good light oak ground will serve for pitch-pine, I prefer the finished effect which is obtained by working over a light buff colour, which shows a decided but soft *reddish* tint, instead of a *yellow* buff. For graining in water, take a little raw sienna ground in water, and slightly "warm" it with burnt sienna, diluting with weak beer as in maple-graining colour. Spread this wash evenly with a tool over the panel, and then with a goose sable pencil run in the heart-grain, using a slightly deeper shade of the sienna colour. After putting in the centre grain, take the pencil overgrainer, sable or fine hog-hair, and draw it down the sides to get the straight outer grain. A touch of Vandyke brown may be used to slightly darken the knot or heart, but the grain otherwise

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should be the same *tone* as the ground paint. Before the work is dry the heart-grain is softened and graduated with the badger as when overgraining oak (Fig. 3). To get the best results the work must be "bound down" with "*Japanner's*" or varnish, and then rubbed over with the same graining colour, and mottled after the style of working maple (Fig. 4). This method gives the worker good scope for his skill, and when varnished may often be mistaken for the real thing, even by experienced painters.

Pitch-pine grained in Oil has one advantage over the above—it requires no binding down before the overgrain or mottle is put on. To wipe quantities of sap-oak in oil, naturally and without repetition, is a hard task to many a worker, who, however, will find the pencil work much easier, cleaner, and quicker. The mixing of a sienna oil-graining colour, the method of spreading it, and the manner of wiping such figure, are matters that have all been thoroughly explored in their connection with oak graining; the only material difference between wiping sap-oak and pine-heart is that a good "springy" badger, or a hog-hair softener, has to be used to work up the wiped figure in the centre and to soften the hard edges of the combed grain at the sides.

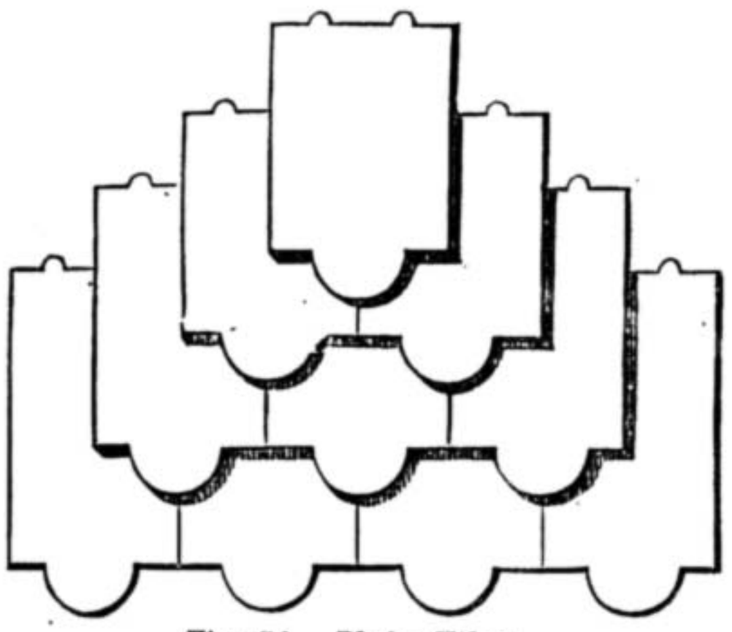

Fig. 54.—Plain Tiles.

In closing my directions for imitating maple and pitch-pine woods, I need scarcely point out the necessity of working from a good natural specimen, or, the next best thing for the time being, a properly grained imitation of the wood we are studying. When beyond this stage, and the learner applies his skill to graining furniture and the woodwork of buildings, the previous directions I have given—as to *contrast* and sharpness of rail with stile, the *simplicity* of figure and grain upon moulded surfaces, and the *due subservience* of the work on the framing or stile parts to that contained in the panels—must all be remembered and intelligently followed, to the end that the grained door presents that repose in its entirety which we find in the best woodwork.

BRICKLAYERS' WORK.

BY MUNIO.

Furnace Chimneys.

Furnace chimneys are built of various sizes and heights, according to the purposes for which they are required; the higher the chimney, the larger should be the size of the base, and it is advisable in all cases to lay a bed of concrete under the footings, as this forms a good uniform foundation. Fig. 51 is a section of a chimney, showing the manner in which they are usually built. A is the concrete; B is the base; C, stone base-course; D, shaft; E, stone top; F, fire-brick lining; G, flue. The concrete is brought up to a level surface, and the footings for the base built upon it; the centre portions of the footings should not be filled in solid, as the settlement of the chimney generally causes the concrete to rise in the centre. The base is generally built thicker than the lower portion of the shaft, and is lined with fire-bricks set in fire-clay; the flues are arched at the top, and an invert formed at the bottom; four strong iron cramps should be walled in the centre of the brickwork under the inverts, and above the arches; when the walls of the base are very thick, two rows of irons should be used: they are fixed by pins at the corners. The stone base-course is also cramped with iron cramps let in flush, and run with cement. The shaft is generally built from the inside, or "overhand," as it is termed. Two strong putlogs are laid across the inside of the chimney. On these the scaffold boards are laid, an opening being left in the centre, above which on a proper support a pulley is fixed, and the material is drawn up by means of a "gin," or steam engine.

The stalk is diminished, or set on, from the inside every 20 or 25 feet, and the fire-

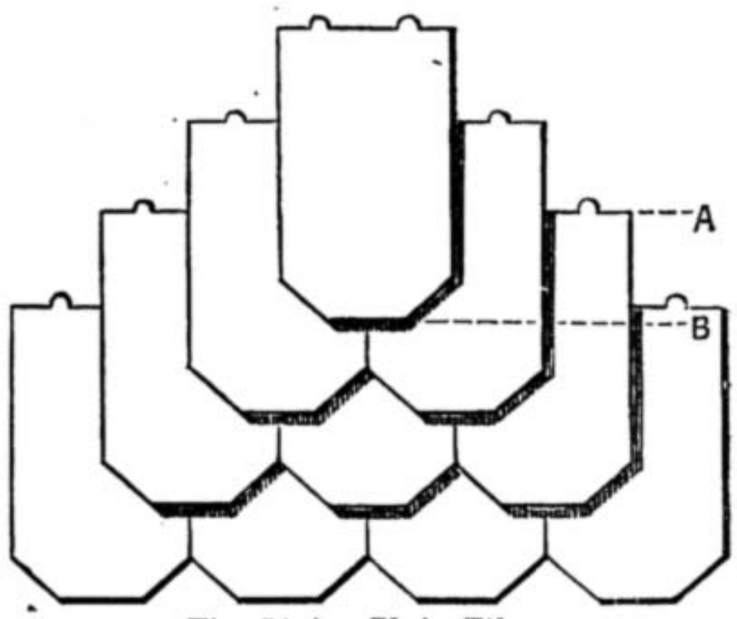

Fig. 54 A.—Plain Tiles.

brick lining is generally carried half-way up the stalk, except in cases where a very great amount of heat is brought into the chimney, when it is carried to the top. In such a case the work should be 1½ bricks thick at the top, 1 brick being the usual thickness. Sometimes the lining is carried up plumb instead of being set off, but the work is not so strong, the bricks having to be cut in nearly every course; sometimes a cavity is left between the lining and outside brickwork. In this case it is advisable to have gratings at the top and bottom to prevent gases accumulating in the cavity. The outside of the stalk is built with a batter of from ½ in. to 1 in. to the yard. The top-stones are cramped together with iron cramps, and iron straps or ties are walled into the brickwork of stalk every 3 feet in height. Cast-iron tops fixed together by bolts are sometimes used instead of stone: these are filled solid with brickwork, and cemented over.

A lightning conductor should be fixed on the chimney as soon as it is finished, and all the putlog holes should be walled up and made good.

TILING.

When roofs are to be covered with tiles, the timbers should be stronger than for slating, as tiles are much heavier than slates; the roof should also have a much steeper pitch than for slates. Tiles are of two kinds: pantiles and plain tiles.

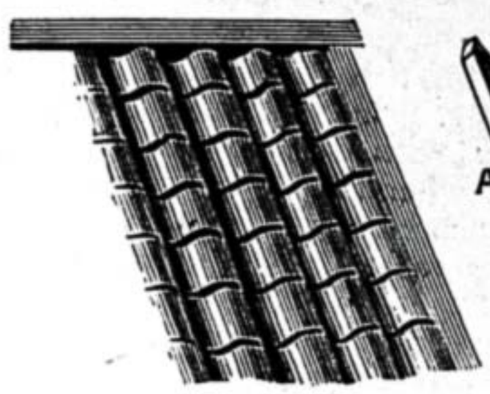

Fig. 52.—Pantiles—A, Single Pantile, showing Form.

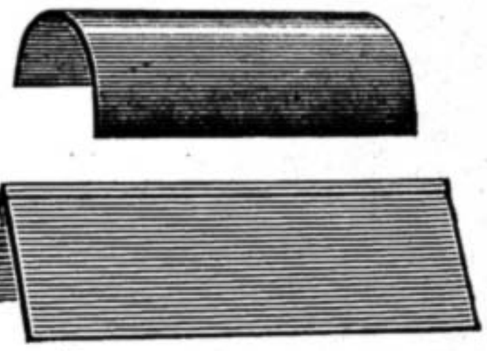

Fig. 53.—Ridge Tiles.

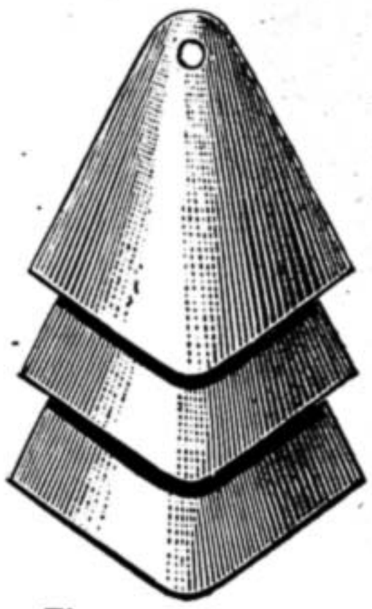

Fig. 55.—Hip Tiles.

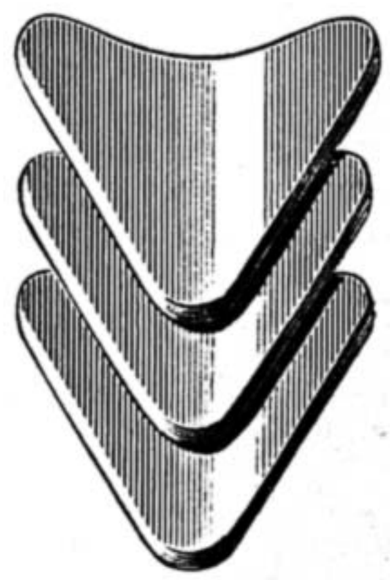

Fig. 56.—Valley Tiles.

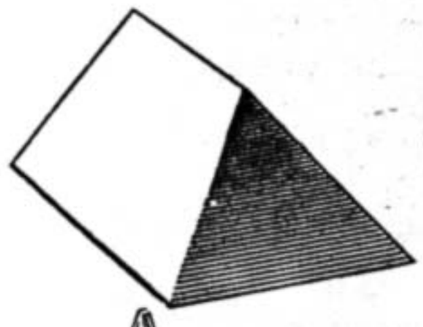

Fig. 57.—Ridge Tile for Hip End.

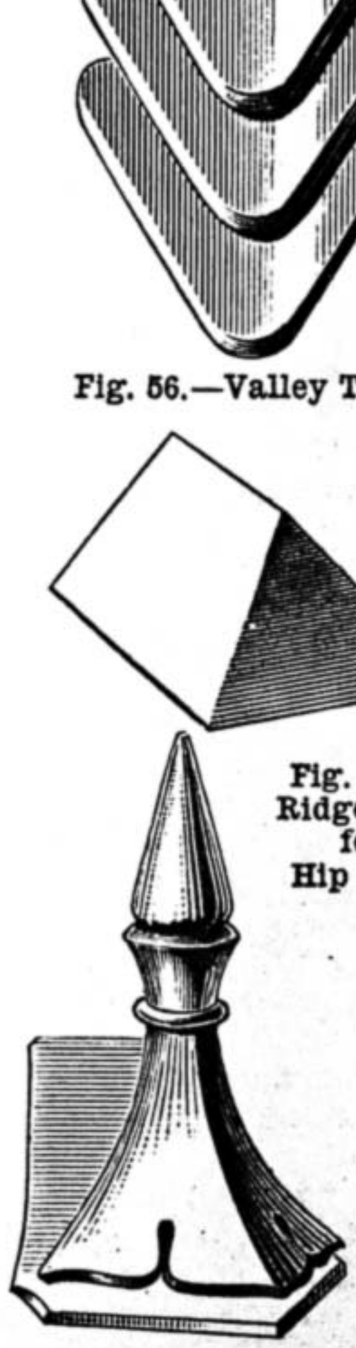

Fig. 58.—Finial for Hip End.

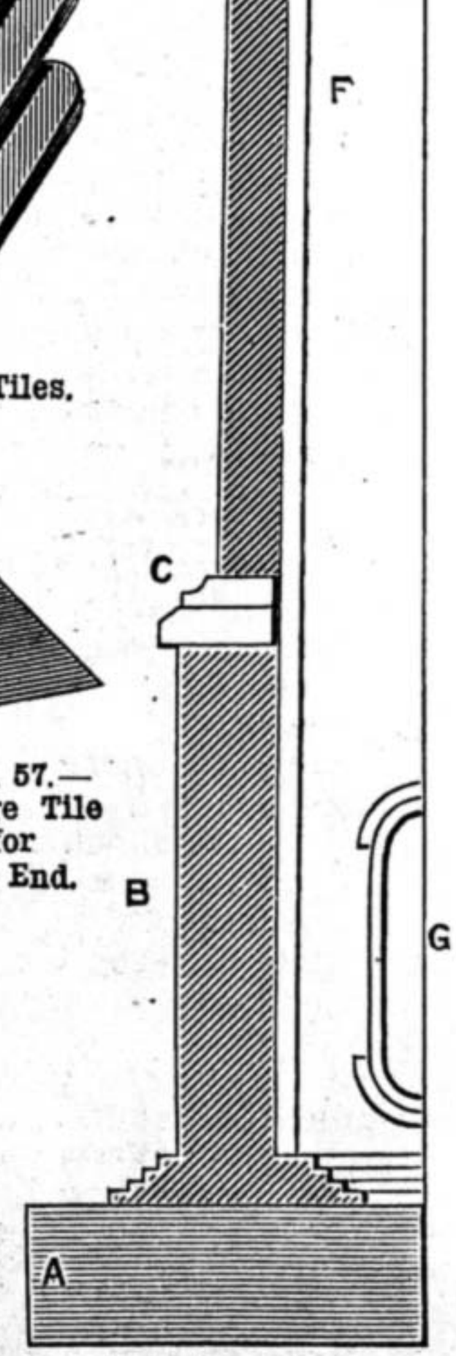

Fig. 51.—Section of Furnace Chimney.

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PANTILES.

Pantiles are concave on the upper side; the right-hand edge, being turned over, is called the roll (see A, Fig. 52). They are hung on wood laths, nailed to the roof timbers, by means of a nib formed on the top end. The gauge of the laths is from 10 in. to 10½ in., depending on the length of the tile; if the gauge is too narrow, the roll of every tile will have to be cut at the top corner, and if too wide, the tiles will not turn the wet. In commencing to fix the laths, nails are driven about ½ in. into the two end rafters to the gauge; if the rafter does not divide equally to the ridge, the eaves tile can be given a little more lap. A line is then stretched between the nails, and the laths nailed to the line; if the roof does not project at the eaves, the feet of the rafters will be set back about 3 in. to form an eave; if the roof projects, a thicker lath, called a tilting fillet, is nailed at the eave. The eaves tile generally projects over 3 in.; the tiles are laid from the eaves to the ridge, the roll being kept straight to a line, hung from the ridge with a weight at the end. Any tiles that are crooked are set out to be used for cutting, etc.; the roof should also be gauged lengthways after a few courses are laid, so as to land with a whole tile at the end, by keeping the tiles closer together. The eaves tiles should be bedded in lime and hair mortar. The tiles for hips are cut to the rake of the hip at the top corner, and for valley gutters at the lower corner. The valley tiles should be bedded in lime and hair mortar. The hips and ridges are covered with ridge tiles, Fig. 53: they should be set to a line, bedded in lime and hair mortar, and pointed. In tiling round chimneys, lead flashing should be fixed, as collaring with cement or mortar soon cracks, and lets the wet in.

After the tiles are laid on, they are pointed on the inside, and it is best to do this after rain, as the pointing adheres better when the tiles are damp; sometimes the laths are boarded, or lathed between with plasterer's laths, and the tiles bedded in lime and hair mortar. The tiles are laid from the right-hand corner of the building.

PLAIN TILES.

Plain tiles are flat, and sometimes have the lower corners cut off (Fig. 54); they are hung on laths by two nibs at the top of the tile, and sometimes by pins put through holes in the tops of the tiles. They are of three kinds: ordinary tiles, eave tiles, which are shorter than ordinary tiles, and gable tiles, which are the width of one and a half tiles, and are used for commencing every second course, to get the proper bond. They are laid in parallel courses, commencing from right to left; they are generally laid with 3 in. lap. The lap is the distance the tail or lower end of the third tile covers the head of the first tile; the distance A B, Fig. 54, is the lap. The laths are nailed in a similar manner to pantiling, the gauge being half the length of the tile. After deducting the lap, the eaves are bedded in mortar, and are formed by setting the foot of the rafter back, or by a tilting fillet. The vertical joints should be exactly plumb over each other, and the horizontal joints perfectly parallel to each other: all hollow or twisted tiles should be set out, and used by themselves, as they cannot be laid properly with straight tiles. Zinc or lead steps turned up 1½ in. should be used round chimneys, with top flashing or cement collaring; where hips and valleys occur, the tiles must be cut to the rake of the hip or valley, and the ridges and hips covered with ridge tiles, in the same manner as pantiling. Sometimes the hips and valleys are laid with purpose-made tiles, (Figs. 55 and 56); when these are used, they should be very accurately formed to the angle of the hip or valley, as they look very bad if they stand up above the other tiles. When hip and valley tiles are used, the ridge is finished at the hip end, with a ridge tile similar to Fig. 57, or with a finial (Fig. 58). The tiles are pointed on the inside, or bedded in lime and hair mortar, on boards or plasterer's laths, nailed on the roof timbers between the tiling laths.

MEASURING.

Brickwork is measured by the cubic yard of 27 feet, by the standard rod of 272¼ superficial feet, one and a half brick thick, by the rod of 63 superficial feet without regard to thickness, and by the superficial yard of 9 feet, reduced to one brick thick.

Foundations, piers, and other heavy work are measured by the cubic yard, and ordinary walls by the rod, or superficial yard; the openings are deducted net size, but an allowance is made for extra labour in building the jambs or quoins of openings.

Rubbed and gauged arches, and cut and moulded work, are measured by the superficial foot, the whole of the face being girted.

Plinths, strings, cornices, etc., are measured by the lineal foot or yard, the girt being taken. Facing with bricks of a superior quality is measured by the superficial yard, extra on ordinary work. Pointing is measured by the superficial yard, large openings being deducted, and the jambs measured.

Chimney breasts are measured solid on account of the extra labour in forming the flues; the pargeting or plastering of the flues is measured by the superficial yard; chimney tops are usually measured by the superficial yard.

Paving and flooring are measured by the superficial yard. Digging and excavating and concreting are measured by the cubic yard. Drain pipes by the lineal yard; bends, junctions, and traps, at so much each.

Arching and circular work are measured by girting the inside of the arch and the outside, and adding the two together and dividing by two for the average girt; this, multiplied by the length, will give the area.

To reduce brickwork to the standard thickness of one and a half bricks, multiply the area of the wall by the number of half bricks it is in thickness, and divide this by three.

In all cases the cost of scaffolding should be included in the price, and when the work is executed in a street, or where traffic is carried on, an extra price must be put on.

Tiling is measured by the square of 100 ft. or by the superficial yard, large openings being deducted, but small openings are generally measured, in consequence of the extra work in cutting; cuttings to hips and valleys are measured by the lineal yard or foot, and ridge tiles by the lineal yard or foot. Zinc or lead steps are counted at so much each.

All cuttings to gables, and cutting and pointing of flashings, are measured by the lineal yard or foot.

With this I may bring my remarks on "Bricklayers' Work" to a close. I have touched briefly, but, I trust, sufficiently, on every point that bears on or is included in this most important branch of the building trade. Any special information that is required must be touched on in "Shop," which, as my readers are well aware, is always open to all inquirers.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

80.—"EXERCISES IN WOOD WORKING."

MESSRS. D. APPLETON & Co., New York, send me through their London agents, Messrs. William Allen & Co., Caxton House, Paternoster Square, a well-printed, well-illustrated volume entitled "Exercises in Wood Working: with a Short Treatise on Wood," written for manual training classes in schools and colleges by Ivin Sickels, M.S., M.D., a book of which space forbids me to say little more than that it is ably conceived and admirably carried out, dealing briefly but comprehensively with everything in connection with wood working on which it is necessary to touch. The introduction sets forth very clearly the beneficial effect of manual training on mental development, and the close connection that exists between drawing and wood working. The text itself deals with carpentry and joinery, and is divided into two parts, of which the first treats of the structure, properties, and kinds of wood; its manufactures and economic relations to other substances; the parasitic plants and insects that infest timber; and the means of preserving wood. The second part contains various exercises on the use of the tools used in wood working; sharpening tools; and the construction of the various joints made in carpentry, joinery, and cabinet making, and of many parts of the house, etc. Some hints are afforded on shaping a boat model, and the volume is aptly wound up with instructions in veneering, polishing, and painting. The price of the volume is 5s.

81.—"HANDRAILING AND STAIRCASING."

This is the second edition of an important and useful work by a practical handrailer, Mr. George Collings, author of "Circular Work in Carpentry and Joinery." It forms one of Weale's Rudimentary Series, and is published at 2s. 6d. by Messrs. Crosby Lockwood & Son, Stationers' Hall Court, Ludgate Hill, E.C. It is clearly written, plainly illustrated, and will be found valuable and helpful to all who are seeking information on this subject. Its aim and scope will be best recognised from its title, which runs thus:—A Practical Treatise on Handrailing, Showing New and Simple Methods for finding the Pitch of the Plank, Drawing the Moulds, Bevelling, Jointing Up, and Squaring the Wreath: to which is added a Treatise on Stair Building. Staircasing is a stumbling-block to many a young carpenter, who will find many things that he does not now understand made clear to him by the perusal and study of this volume.

82.—"SCREW THREADS."

This is a handy little book for the waistcoat pocket published by Messrs. Crosby Lockwood and Son, Stationers' Hall Court, Ludgate Hill, E.C., and written by Mr. Paul N. Hasluck, the well-known author of "Lathe Work," "The Metal-turner's Handy-book," and many other useful volumes on subjects involving manual labour of a high class. It is entitled "Screw Threads, and Methods of Producing Them, with Numerous Tables and Complete Directions for using Screw-cutting Lathes." It is freely illustrated, and having now reached the third edition, the author tells us that it has been entirely rewritten and increased by more than one half. It claims to contain more information on the subject than any treatise extant. THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

*** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

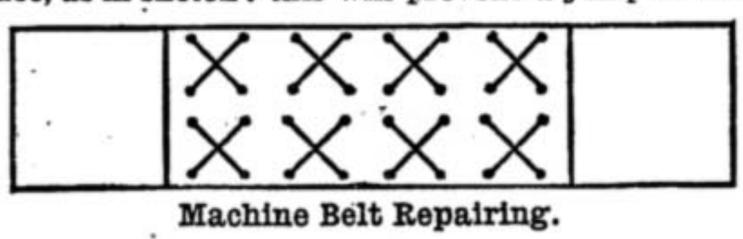
In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page or number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Cheap Overhead.—J. L. writes:—"This overhead by H. A. Miles (see WORK, page 365, Vol. II.) has certain defects which prevent it from repaying the maker for his labour. In fact, it will give as much trouble in its construction as will suffice to make a better one. The only object of the swinging frame and hanging weight is to keep tight the cord from the fly-wheel to the end of roller; but this distance is constant, and the cord once fitted needs no arrangement for varying tension. But again, as the designer evidently foresees, this cord will prevent the action of the weight and swinging frame upon the second cord, necessitating the tension pulley and weight; and as this is a necessity, the swinging frame is useless, and the roller may as well be directly mounted on centres between its standards. But if a second roller is fitted to run upon the bar on which the frame swings (or two cone pulleys which are preferable), and if the main cord is taken to this axle with a short cord to the groove in the front rollers, then the swinging frame will act on the secondary cord which drives the cutters, and may be raised or lowered by the weight without affecting the two primary cords; and thus also the objectionable tension pulley is no longer needed."

Gaiting Wheels.—See reply to A. P. (*Hardy's Gate*), WORK, p. 440, WORKER BEE (*Hertford*) writes:—"Allow me to point out to W. P. that his reply on the above subject is very vague, not to say misleading. W. P. makes no allowance whatever for the variations in length and taper found in the various kinds of axles and pipe boxes. Very recently I had to make a pair of wheels for an old axle, and one box was ¾ in. taper, while the other was barely ⅜ in. How would W. P.'s 'secret of allowing a small ¼-in. hook off every inch measurement in the dish of the wheel' apply in that case? as it is evident, if the wheels are to run alike, both arms of the axle must not have the same amount of 'hook.' If W. P. were to give either of my apprentices such a reply as he has given A. P., he would get derided for his pains. Here is a formula that will apply to all kinds of axles or arms and wheels of whatever dimensions. But to illustrate our point we will suppose we have to set a pair of arms, the boxes for which are 11 in. long, 2½ in. internal diameter at one end, and 1¾ in. at the other. The width of tyre is immaterial for our purpose, but the wheels are 4 ft. 8 in. high, and the spokes are 1 in. dish, measuring as W. P. has directed. We will proceed to find the amount of 'hook' required as follows:—With a straight-edge and pencil on a piece of clean board draw a straight line A B, at least 3 ft. 6 in. long. From A measure off 1 ft., and make a X at that point. From the X again measure off 2 ft. 4 in., which we will mark *b*: this represents half the height of the wheel. From the X again measure off 11 in. towards A: this we mark *a*, which represents the length of the box. At the point *b* we next measure off to the right a space of 1 in., which represents the dish of the wheel: this we mark D. We next, with our straight-edge, draw a line from the point D, crossing the line A B at the spot marked X, continuing it on to the point C. We next set a pair of compasses to 1¼ in., which represents one-half the internal diameter of the box at the largest end: this we prick off on the left of where the lines cross each other at the point marked X, and mark it *h*. Again set the compasses to ⅜ in., and prick that off on the left of the line C, parallel with the mark *a*: this represents the small end of the box, and we will mark it *f*. Now, the difference in measurement from the point *h* to the line A B, at the point where it is marked X, and the point marked *f* to that marked *a* on the line A B, represents the amount of 'hook' required to give the axle, to make the wheels run as they should. In this case it amounts to barely ⅛ in., as A. P. will find if he works it out full size."

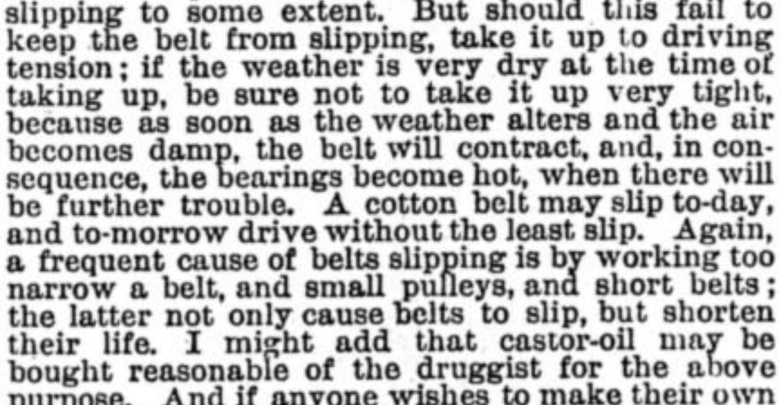
Leather and Cotton Machine Belts.—A. R. (*Scorrier*) writes:—"I have often heard it asked—Which of the above belts do you prefer? and, as each have certain advantages, I pen the following. No doubt the leather belt will drive with less tension than most cotton belts, and is not so liable to wear at the edges in frequent throwing on and off the tight and slack pulleys; but where a belt drives direct, and even where it has not to be thrown on the tight and loose pulley, often the cotton belt answers well—that is, if the right kind of belt is selected. One reason the leather belt drives with less tension is, as a rule, it is more pliant, and adheres to the pulleys more so than cotton, which is a matter of some importance, as it requires less power to drive it, and will last much longer than a cotton belt that is hard and stiff. In buying a cotton belt, always see that it is pliant; if not, it will very soon crack in many places, and soon become useless. For instance: about six years ago we had a 10 in. cotton belt from a certain maker, and an 8 in. belt from another maker; at the end of two years the 10 in. belt had to be thrown on one side, and another from where we purchased the 8 in. belt put in its place. The 8 in. belt, that has been in constant work for six years, is still in good condition, and, by all appearance, will stand years longer. The last 10 in. belt is doing well, and is in good condition; so much for the choice of cotton belts. I might say that these two belts are driving direct. Again, although I prefer a leather belt in some cases, there is one thing I have against it—that is, its irregular running. As a rule, some lengths of the leather stretch more on one side than on the other; consequently, the belt sways, which is very annoying. The cotton belt, being in one length and texture even throughout, runs true if put together square. Perhaps a word on how to join a cotton belt will not be out of place. In the first place, take a square and mark the end the length you want to cut off—the ends being perfectly square—butt them, and take a piece of the same width belt and place over the joint and cross; lace, as in sketch: this will prevent a jump in the



Machine Belt Repairing.

belt, and it will not break as soon as if the ends were lapped. Another thing to be considered is the cost of the belt; a cotton belt can be had for less than one-half the cost of a leather belt, and there being so many joints in a leather belt, when they once commence to give out will waste a deal of time in repairing. Again, the question is often asked, How to prevent belts slipping? and very often very unsatisfactory answers are given. Some will say, the belt should be kept pliant, and at the same time recommend resin, etc., which will tend to make the belt hard and shorten the life of the belt. By all means I would say avoid resin, especially on leather belts; to keep belts pliant, and to prevent slipping to a great extent, a leather belt should be sponged over with warm water two or three times a year, and some dubbin rubbed into it; and, in case of slip, leak a little castor-oil on the side next the pulleys, not forgetting to brush off the dust by holding a brush or broom on the belt while running, before applying the oil. Should a cotton belt slip, brush and apply castor-oil as above. The oil will tend to keep the belt supple, as well as prevent slipping to some extent. But should this fail to keep the belt from slipping, take it up to driving tension; if the weather is very dry at the time of taking up, be sure not to take it up very tight, because as soon as the weather alters and the air becomes damp, the belt will contract, and, in consequence, the bearings become hot, when there will be further trouble. A cotton belt may slip to-day, and to-morrow drive without the least slip. Again, a frequent cause of belts slipping is by working too narrow a belt, and small pulleys, and short belts; the latter not only cause belts to slip, but shorten their life. I might add that castor-oil may be bought reasonable of the druggist for the above purpose. And if anyone wishes to make their own dubbin, the following will be the way to proceed:—Melt some good tallow over the fire, and add one-quarter its weight of cod-liver oil; let cool, and it will be ready for use."

Oval Drawing.—F. C. (*Leytonstone*) writes:—"In reply to J. W. H.'s comment on my letter in WORK, No. 78, I think it would be much better if J. W. H. would test his theories somewhat before publishing them in your valuable paper. For instance, he says (WORK, No. 78): 'Simpler than F. C.'s method of drawing an oval parallel to an ellipse is to keep the pins in my Fig. 3 (page 230, WORK, supplement to No. 66) at G and H as before, and lengthen the thread to any desired distance outside the ellipse, and then proceed to describe the larger orbit, which, though not, strictly speaking, an ellipse, is usually called so.' This is wrong; a glance at my sketch will show this. I draw the



Oval Drawing.

first curve G A H, then lengthen out the string to B, and describe the larger curve; the result is I get another *true ellipse* outside the first, but quite independent of it, and by no means parallel. It is impossible to draw a parallel to an ellipse, either by the string and pin method or by the trammel described by J. W. H. in a later paper, no matter what the proportion of major to minor diameter may be. There is so much difficulty experienced in setting out an elliptic arch, that the ellipse is often avoided altogether, and an arch made up of segments of circles, called an elliptic arch, used in its place. The method of setting out this arch is very ably described by your esteemed correspondent MUNIO, in WORK, No. 79. As to drawing the parallel by means of a working gauge being impracticable, I have seen it done, and have done it myself hundreds of times; of course I did not use a square-faced gauge: common sense will tell anyone that; but with a round-faced gauge the parallel may be drawn near enough for all practical purposes."

Life of an Omnibus Wheel.—F. C. (*Leytonstone*) writes:—"I should like to reply to a question asked me by J. W. H. in a former letter (WORK, No. 70), viz: 'Does F. C. know that the life of a London omnibus wheel is *under ten weeks on an average?*' I was not aware of that; but I know, from actual experience, that a fairly well-made omnibus wheel lasted twelve months on one of the heaviest roads in London; some last longer, but twelve months may be taken as a fair average. A wheelwright working for one of the large omnibus companies assured me they had some wheels that had been running eighteen months. Perhaps J. W. H. means the tyre; but it is a well-known fact that a wheel will wear out several tyres. As to housing the spokes into the stock and fox-wedging, they may do it in America, but as yet, except in isolated cases, it has not been done in England, and from what I can gather in conversations with some of the oldest and most experienced wheel makers in the kingdom, is not likely to be; for my own part, I cannot see the good of it. I think the stock is quite weak enough already without housing the spokes in. Some years ago one of the large railway companies had their road wheels made with the spokes housed into the felloes ¼ in., the object being to prevent the spokes splitting; but I believe the practice is discontinued. As to the 'ounce of experiment and experience,' J. W. H. seems to forget that others may have had quite as good an opportunity of experimenting and acquiring experience as himself; therefore it is scarcely fair on his part to class their ideas as 'tons of precept and prejudice.' There may be some among the much-abused British workmen who are quite as capable of thinking as J. W. H., although they may not be able to express their thoughts so cleverly on paper."

Watch Repairing.—DEAN FOREST writes:—"In running my eye over the 'Shop' columns, I was somewhat pleased to read the complaints of ONE THAT PAYS, BUT WANTS STEADY TICK,' No. 79. Because of it, I feel I must write a few lines in answer thereto, to wish that our friend was with some of our watchmakers in England, for then should he know that there are still those in that trade who would put his watches and clocks in good working condition for him, and that for much smaller terms than are named by HERR SPRING. In answering a few of his remarks, I trust he will pardon me if I seem to take upon me (who am but a young man, and he, I should judge by his letter, an elderly one) the *rôle* of instructor. But I always find that those who boast a great deal are just the ones who lack the qualities and abilities boasted of; so that if a man 'blows his own trumpet,' it is because there is no one else to do it for him. And thus he would have done well to have steered clear of him he entrusted his carriage clock to; for although I am myself in the trade, yet I am confident of this: that there are multitudes of good watches spoiled by incapable or careless repairers, therefore, a great amount of care and discretion needs to be exercised by the possessors of watches. The best way, I think, to find out *the best* watchmakers is to inquire of people, for I find that the only way for my business to become extended is by the recommendations of those for whom I do work, and are pleased with it, and not by advertisements, etc. But, at the same time, I issue handbills occasionally, with a few useful directions for the use of my patrons printed with other matter thereon. I also have been pleased with the 'Hints to Watch Wearers,' by HERR SPRING; and, as a practical repairer, I heartily endorse the greater part of all he has, in his various articles, stated. But, so far as my experience has taught me, I always put the average time at about two and a half years between each time of cleaning. Nevertheless, as he implied, there are cases in which a watch cannot go safely any longer than the eighteen months. In regard to the method HERR SPRING stated of cleaning watches with soap and brush, I consider that immersing them for five or ten minutes in 'essence of lemoine,' and afterwards brushing them up, a superior one. This is the way adopted by me for some years now, and it is, in my estimation, the most thorough and safe way possible." [The handbill that accompanied your letter is well conceived and carried out, and ought to be useful to all watch-wearers.—ED.]

Winter Classes.—SELF-TAUGHT, ANXIOUS, and several other correspondents write, urging the necessity for, and advantage of, winter classes in all trades, with instruction and the use of tools, etc., at low rates. [These correspondents are referred to the Polytechnic Classes, Regent Street, W., and the classes, also, at the City and Guilds of London Technical College, Finsbury, E.C., etc.]

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II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Electrotyping.—ELECTRO.—Machines for electrotyping are usually shunt wound, and made to furnish a definite volume of current. Whilst the resistance of the work exceeds that of the F.M. coils, a portion of the current traverses those coils and keeps up the magnetic intensity of their cores; but when too much work is placed in the vat, the resistance of this circuit is lowered and the current traverses it instead of passing around the coils to magnetise them. As a consequence the current falls in the outer circuit because the cores are not sufficiently magnetised. If the machine fails to give any current when the articles are all placed in the vat, then it must be wrongly wound, the resistance of the coils being too high. Sparking at the brushes is caused by wrong adjustment of the brushes. If the commutator is badly grooved, it must be removed and a new commutator put on in its place. To prevent burning by excessive sparking at one place, see that the brush pads press level on the commutator with equal pressure on all parts, and keep the edges trimmed evenly. Adjust the brushes to an angle found by experiment to be the best to prevent excessive sparking when the full load of work is on the machine. I do not know of a book which will tell you how to keep a dynamo in working order, but may tell you that one is in course of preparation which will embody the information desired by you. A good electrotyping solution is made by dissolving 1 lb. of copper sulphate in 1 gallon of rain water, and adding to this 1 lb. of sulphuric acid; then stir all well together. I shall be pleased to assist you with advice at any time; but you must state every detail of your difficulty when you write, so that I may see how you are situated. Correspondents cannot write letters too long, as the longest letter takes less time to read and understand than is consumed in guessing at the meaning of a short letter shorn of details.—G. E. B.

Gramme Dynamo.—R. F. (*Hamilton*).—You should have given the size of your armature as well as the size of the F.M.'s, and also stated how you have connected the coils. I infer that you have connected the F.M. coils in series with those of the armature. You won't get a very good effect on an incandescent lamp with the machine connected in this manner, unless the lamp has a low resistance. Machines for electric lights on a small scale should be wound so as to connect the F.M. coils in shunt with the armature coils. As you have 1 lb. of No. 22 on the armature, made up in twelve sections, you should have 4 lbs. of the same wire on each core of the fields, or 16 lbs. in all, and then connect the F.M. coil ends to the brushes of the machine in shunt. The machine must be driven the reverse way to work as a dynamo, and the brushes must also be adjusted in a different way to that adopted whilst working the machine as a motor. If you cannot get it to work after reading my articles on this subject, let me know, and I will try to make arrangements with you for seeing the machine.—G. E. B.

Electric Scarf Pin.—R. A. D. (*Forest Hill*).—First get your small pea incandescent lamp. Then get a cheap scarf pin with a large stone or glass in it, and note how the stone is set and how the setting is made. Make a claw setting in a similar manner out of very soft and thin sheet brass, to nicely fit and hold the lamp. You may make the setting in the form of a flower and cause the petals to clasp the lamp bulb. Before setting the lamp, make a hole in the bottom of the setting for the stem of the lamp to pass through, then fix this part to the top of the pin by soldering the parts together. Use a piece of silk braided double line wire, No. 24, as a connector; connect the ends of the wires to the platinum loops of the lamps by twisting the cleaned ends of the wires; bind some silk twist around the joint to hold the wires firmly in contact with the loops, and to insulate the ends of the wires from each other. Also bind the braided wire to the top part of the pin to prevent rupture of the wire. The connecting line of double wire must be long enough to reach from the pin to the pocket in which the push or pressel will be located. Then a piece of the same wire must connect the pressel with the battery. Further directions for making these lamps will be given in the last article of the series on "Model Electric Lights."—G. E. B.

Magnesium Wire (Correction).—W. A. W. writes to correct a statement on page 387, respecting price of magnesium wire. The price of this wire has fallen during the last two years from 12s. 6d. an ounce "to 2s. 6d. an ounce, and can be obtained at that price from any photo stores."—G. E. B.

Electric Clock.—H. S. (*Byker-on-Tyne*).—Limited time and space preclude a full description of an electric clock. Referring to your sketch, the two bobbins on each side of the pendulum are left hollow to admit the ends of the cross-piece on the pendulum. This cross-piece may be of soft iron or of magnetised steel. If of soft iron, which is most likely, the two coils are solenoids—that is, they are so contructed as to draw into themselves the ends of the iron bar, and in this case each coil is complete in itself, the ends of each going to a current interrupter placed near the top of the pendulum. As this swings to the left it causes the interrupter to break contact with the ends of the left-hand coil and make contact with the ends of the right-hand coil; the current then goes through the right-hand coil and draws the right-hand end of the cross-piece into itself; this causes the interrupter to make and break contact on the other side, and the current then passes through the left-hand coil. Thus the current is sent alternately through the coils by the motion of the pendulum, and its motion is maintained by the cross-bar being alternately attracted into the two coils. The size of this bar must be proportioned to the size of the clock; doubtless you have rightly guessed the size of the bar seen by you. You have also, I think, rightly guessed the size of the bobbins. They may be made of brass, coated with silk ribbon, and filed with very fine (36, 38, or 40) silk covered copper wire. Very fine wire is necessary to get a good magnetic effect with a small current of electricity. The battery in general use for electric clocks is the gravity Daniell, because this is the most constant battery when a continuous small current is required through a high resistance. If you know how to construct a clock with the pendulum so arranged as to beat seconds, you will have no difficulty in constructing an electric clock to beat time in a similar manner, as the current merely furnishes motive power to the clock. I should mention, however, that the two bobbins must be uniform, and be wound exactly alike with the same length of wire, each having the same resistance, so that the attractive power of one coil may be the same as that of its neighbour.—G. E. B.

Overmantel, etc.—GRUPH PRAWNE.—For any, except the commonest, furniture varnishing is not a suitable method of finishing. Oiling it before varnishing would not improve the appearance or remove the faults incidental to varnished furniture. Oil brings out the colour and markings of the wood, but does not prevent the coarse look which varnish gives. If you do not care to French-polish, and, as you say, it requires experience to do it properly, nor to give the time required for oil-polishing, you might finish your furniture by wax-polishing. If the wood is not naturally dark enough to please you, oil it before polishing, or even stain it slightly. I do not think it likely you have seen oak furniture *varnished* and "deadened," or, as it is generally called, "dulled" afterwards. Furniture is often *polished* and dulled. If you wish to finish in this way, the work, after having been French-polished, must be brushed or rubbed down with some fine powder such as pumice powder. This destroys the gloss, and the work is said to be dull French-polished. Looking-glass would not be out of place in an overmantel such as you refer to; indeed, many people would consider it incomplete without some glass. As for mouldings of a different kind of wood from the bulk of the work, I hardly know how to advise you, as so much depends on the design, or rather on the taste of the designer. Without knowledge and experience it is, as a rule, injudicious to introduce various woods in the same piece of furniture in the way you suggest. The combination is very apt to destroy the harmony or breadth of the work, making it look fidgety and vulgar. There is, however, no definite rule to guide one, nor does the mere fact of several woods being used violate any recognised canon of art; the way in which it is done is everything.—D. A.

Air Compressing Pump.—EXPERIMENT.—To enable me to give you a dimensioned sketch of air-pump, I should require further particulars, such as, is the air to be used hot (it will rise considerably in temperature under compression), or will it be stored and allowed to cool? In the latter case the loss of power will be much increased. By what power do you propose to drive your air-pump? Grid-valves of brass or iron covered by vulcanised indiarubber discs will be suitable for the pump. You will find a variety of pump valves illustrated and described on page 513, Vol. I. of WORK, and amongst others, those suitable for air-pumps. A double-acting piston-pump with metallic packings, and lined with or made of brass, should give satisfaction. A half-horse power is equal to 16,500 foot-pounds of work per minute. To obtain this effective power you must allow 15 per cent. for friction and loss, therefore the compressed air delivered must be capable of doing 18,975 foot-pounds of work per minute; therefore at 30 lbs. pressure per square inch, you must deliver 4·4 cubic feet of air per minute. You will find this method of transmitting power very wasteful. An electro-motor would be more efficient and less trouble, or, unless you get your power for nothing, you might use an oil engine with advantage.—F. C.

Magic Lantern.—J. G. B. (*Walthamstow*) is anxious to make a first-class biunial magic lantern, mahogany body, etc., for limelight, also capable of being converted into a triple lantern, and asks for the necessary instructions where he can get, and at what cost, brass fittings for the same. I have an article partly written in which I shall try to supply all the information needed, and which will be submitted to the Editor at an early date.—O. B.

Frame Quotations.—A READER FROM NO. 1.—If the moulding costs you 20s. per 100 ft., I should reckon the cost 2½d. per ft., and glass at 3d. per ft. super. Suppose you are asked the cost of a frame 36 in. by 24 in. (glass size), made of 2½d. per ft. moulding, and say your moulding is 3 in. wide, it would take 12 ft. .. .. 2s. 6d.

Glass, at 3d., 6 ft.	1s. 6d.
Backboard	0 4d.
Joining, brads, etc., glue ..	0 6d.
Net cost	4s. 10d.

Net cost per foot you might say 5d. It is impossible to give an accurate price per foot to embrace all sizes at one standard price, as the risk in breakage of a large glass must be covered, and in any case could not be done at the price of a small one; as, for instance, I make a 1½ in. solid oak frame, with ¾ in. best gilt flat glass and back, with rings for hanging, rebate or glass size, 18 in. by 14 in., for 2s. to the trade at per dozen—which is equal to 4d. per ft., yet for 40 in. by 30 in. it is impossible to do under about 7d. or 8d. The custom of the trade is to get a sample board and mark it in a private manner per foot, suitable width for size, as a ¾ in. moulding is assumed for small frames, and 3 in. moulding for large ditto. Of course, frames without glass, for oil paintings, are the same; large or small, the price remains equal.—G. R.

Indiarubber Tubing for Hookahs.—SMOKER.—You may get the tubing at a rubber merchant's, but it would not be encased in silk; and as this seems to be a *sine quâ non* with you, you should make application to a "tobacconist's sundryman." The sundrymen are men who supply the various trades they represent with any and every article that is wanted or can be asked for in their several lines. Thus Messrs. Maw & Co., Aldersgate Street, E.C., are "druggists' sundrymen." I do not know the name of any tobacconists' sundryman; but as you live in London you can consult Kelly's London Directory. Do not apologise for "badgering" me; I am glad to be "badgered" after your fashion.—ED.

Magic Lantern.—S. R. (*Newry, Ireland*).—As far as I am aware no article has appeared on the construction of a magic lantern in WORK. In reply to the question, "Say if there is an article on hand, and about when will it be printed?" I can only answer by saying there is an article on hand, which I hope at an early date to submit to the Editor, but when it will be printed is beyond the range of my knowledge; that is a secret known only to the Editor. He is the only one who can judge as to the fitness of the time. You should purchase the Index to Vol. I. of WORK, and see what has appeared in "Shop" concerning the Lantern.—O. B.

Fishing-Rod.—COOPER (*Kentish Town*).—Such a rod as you require need differ only from an ordinary one by being stiffer. If you make it with standing rings, it will be all the better. A short article on home-made fishing rods is in the Editor's hands, and may possibly have appeared ere this meets your eye.—D. D.

Advertisements.—N. L. B. (*Grantham*).—This subject has already been referred to several times, and nothing more can be said on it in "Shop."

Stilts.—W. H. L. (*Southwark*).—Any good tough wood will do, but if you have a choice among the most commonly attainable kinds, perhaps ash will be most suitable. As you ask for hints, I may suggest that the height you propose making them is far too great for a novice, and if strapped to the knee will be dangerous and useless.—D. D.

Staining.—MONA.—The wood to which you refer has probably been stained first and then oiled; but of course without seeing it it is impossible to say definitely. Any way, you should have no difficulty in attaining your object by this means, and it is certainly the usual method of making a light wood darker. Try the effect on waste bits of wood of various stains, and select the one you like best before staining your fittings.—D. D.

Fretwork Stencils.—S. H. H. (*Brighton*).—I have never heard of white Bristol cardboard fretwork stencils, and do not think that any are prepared for sale. If you have seen them they were probably made by, or specially for, the user. They certainly are not part of the ordinary stock-in-trade of publishers of fretwork designs. If you want some, why not get the designs, mount them on white Bristol, or any other cardboard, and cut them out with a penknife?—D. A.

Books on Electrical Engineering.—ENGINEER.—When you ask for the best book on electrical engineering, your question covers a wide subject embracing all that pertains to the best engineering combined with a perfect knowledge of all that pertains to electrical science. It is clear, therefore, that no book outside an encyclopedia could contain all you ask for. If you have a knowledge of engineering, and wish to study its application to electrical work, get Sprague's "Electricity: Its Theory, Sources, and Application," price 15s.; and Thompson's "Dynamo-Electric Machinery," price 16s. You may also learn something from Fiske's "Elements of Electrical Engineering," obtained from Spon & Co., at 10s. 6d. I have a very high opinion of Joshua Rose's book. His writings are all very good, because so clearly expressed in every detail.—G. E. B.

Casting in Plaster.—W. G. (*Stoke-on-Trent*).—I am much of the opinion of this correspondent as to experience giving a man the best right to be heard on practical matters; but I would remind him that possibly the sculptor who writes under the name of "Mark Mallett" may be a person of longer experience than his critic. W. G. claims fifteen years' practice; Mark Mallett has been a worker in plaster more than twice that time, and was exhibiting statuary of his own modelling and casting at the Royal Academy and elsewhere in the days, probably, when W. G. was mastering his A B C. He is therefore no novice in the particular kind of work under consideration. If W. G. prefers to use his hand for mixing and throwing on his plaster, no one need object to his so doing, neither need anyone object if he prefers to use his fingers in eating his food; but he need not therefore cavil at Mark Mallett, who elects to use a spoon for his plaster, and a fork for his pork. When two methods lead to the same end, the more cleanly one is to be

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preferred. The point is merely one of taste and habit. The second question raised by him as to whether hoop-iron is not better than small bar-iron for strengthening moulds is not a matter of so much indifference; the irons are used to make the moulds rigid, and hoop-iron will not do this like bar-iron. But what he calls my "greatest error" is my statement that if a waste mould is thoroughly saturated with water, the cast will not adhere to it, and that any grease or other foreign substance applied to make the cast leave is superfluous. I can only repeat that such is the fact: that I have cast numberless models in this way, and that he or any other person can easily prove it who chooses to do so. I can only suppose that he must in some strange manner have misunderstood me. I would suggest to him that when in future he undertakes to criticise anyone who may possibly know more about the subject in question than himself, a little modesty may not be out of place.—M. M.

Heating Plant Case.—J. T. (*Hull*).—I am afraid that it will be a work of some difficulty for you to heat your little greenhouse in the way that you suggest; it is so very small that the expense of fitting up a constant supply boiler with piping would be much greater than the total cost of the whole concern. I can, however, suggest a plan that might answer, and that would cost little to try, at any rate. As I understand your letter, the case is in front of a window, looking into your yard; make, then, a small stand or table (a bracket shelf fixed to the wall would answer as well), place it at one end of your case, buy an ordinary small-sized oil stove, and set it on the table; on top of the oil stove place a tin boiler, to hold, say, about one gallon; into this boiler, about 1 in. from the boiler, make two holes, 1 in. diameter. Procure as much 1 in. tubing as will go round the sides of your case (inside, of course); insert the two ends into the holes in the boiler, and solder them firmly. You can now fill the boiler with water, light your stove, and the hot water which goes through the piping will heat the plants; of course, you must regulate the stove to obtain the proper amount of heat, and use a thermometer inside to denote the temperature. Cover in the boiler with either wood or sheet iron, and be sure, if you have a lid on it, to have an escape hole for the steam, otherwise you may have an explosion. The height of the boiler stand from the ground will be regulated by the size, or height, of the stove and the boiler, which you can easily find. As to the supply, you will have to add water from time to time to make up for the evaporation. By the use of a piece of wood in the boiler as a float, you can arrange, with a little ingenuity, to have an indicator inside the house to let you know when the boiler requires filling up, or you may cause it to ring a small bell. Perhaps from these few hints you will be able to fit up the kind of thing you require—at least, I hope so; and allow me to thank you for that sketch—it showed exactly what you wanted.—G. LE B.

Hinge.—G. W. B. (*Leyton*).—Hinge the cover with two brass butts in the usual way. Then get two curved springs, only slightly cambered, and screw one end of each on the top edges of the box ends, letting them in slightly, so that when the cover is down and fastened it will lie close in the joint, and the springs be pressed flat into their recesses. When the lock or the hooks are unfastened, the curve of the spring, being released, will cause the cover to fly upwards.—J.

Banjo and Dulcimer Making.—G. H. (*Camberwell*).—You can obtain the Index to Vol. I. of WORK from the publishers, Messrs. Cassell & Co., post free, for 1½d., or from your bookseller or newsagent for 1d., and you will then be able to see what has already appeared on the subjects named.—ED.

Answers in "Shop."—X. Y.—Replies to questions in "Shop" are given as quickly as space will allow. I agree with you entirely as to the desirability of giving an answer to each query in the shortest possible time, and I can assure you that in most cases this is done to the best of our ability.—ED.

Keying on Bicycle Crank.—J. M. E. (*Openshaw*).—File the flattened part on the axle *dead flat*. Then file out the *slot* in the crank with a square file, thus forming a fresh square slot, then make a new key from a bit of steel to fit exactly, so that when driven home it will fit very tightly. The key should be no longer than will just pass through the eye of the crank. I may mention that it requires practical experience in this kind of work to make a successful job, and without it J. M. E. is not likely to succeed. Even by practical makers the cranks have a trick of coming off when least wanted.—A. S. P.

Square Hole Drill.—BLACKSMITH.—I am obliged to you for the cutting you send with reference to the square hole drills recently introduced. One of them has been shown to me, but as I have not yet received a specimen drill for testing, I am unable to do more than testify the fact of their existence. As soon as I receive one from the makers, a full description both of the drill and its performance shall be given.—ED.

Wood Buying.—PRACTICAL.—Write to Messrs. D. Witt & Palmer, 168, Drummond Street, Euston Square, N.W., who are now supplying Hungarian oak boards at low prices. These oak boards are equal to any Odessa crown, and are square, and free from sap. They will also quote for walnut and mahogany; also try Snewin's, Back Hill, Hatton Garden, E.C.—A. J. H.

Repairing Old Sink.—G. H. (*Paddington*).—It is always a difficult job to solder an old zinc-lined sink, the grease, etc., seem to penetrate the very pores of the metal, therefore I am not surprised that you failed to make a good job, though I suspect that you did not persevere with the scraping long enough, for although difficult, it is not impossible, and with good clean surface and raw spirits you ought to have succeeded. I do not think that cement will answer, as it will crack away. I should take a piece of zinc about a foot square, cut a hole in the centre slightly smaller than the rim that the grating drops in, place it in position over the grating, mark round the square, and then well scrape the sink a ½ in. each side of the line; scrape clean the brass rim, replace the new piece, tack it in several places, and then solder it, first round the grating frame, and then the four sides of the square. This will make a good job, and I fail to see any other way except relining the sink.—R. A.

Asbestos Cloth.—BURNT ONE.—You can get asbestos cloth, that I think will serve your purpose very well, from Bell's Asbestos Company, Limited, 118, Southwark Street, London, S.E.; the price I cannot tell you, as it varies considerably in the different styles and thicknesses; but if you apply to the firm, they will, no doubt, inform you if you give full particulars of what you require. The Birmingham Agency is 7, John Bright Street.—R. A.

Various.—K. M. D. (*Harling*).—Surely you cannot seriously think that the "Shop" columns are too short, seeing that all questions coming within the scope of WORK are answered as fully as possible. I say as "possible" advisedly, for sometimes questions are so vague that even the wisdom of Solomon would hardly enable those of us whose duty it is to reply to understand what is asked. I answer your questions as follows in the hope that I understand them:—(1) The best thing you can do to restore (as far as it can be restored) faded morocco is to go over the surface very lightly with a little French polish. If you want to give it a little colour, put some appropriate colouring material in the polish. This answers your inquiry about green morocco, though it is possible you use the word "seating" to distinguish the covering from morocco. If so, say what kind of seating you refer to. (2) From any good dealer in cycling appliances, or from many oil-and-colourmen. Buy it in any quantity to suit yourself, and arrange with the dealer who supplies you about the price. Surely this compound question need not have been sent if you had chosen to consider. (3) Use any of the "enamel" paints. It would be absurd for you to think of making it yourself. (4) Use any ordinary "mahogany" stain. You can easily make one of Vandyke brown, Bismarck brown, and water. The more the latter brown is used the redder will be the stain. Mind, that is a very powerful pigment. (5) Any good, hard varnish is suitable for the purpose; but how on earth can you expect a varnish to "leave wood free from knots and unevenness?" If the wood has knots in it, no varnish will remove them, and to avoid unevenness, see that the work is properly finished "in the white." (6) I know of no works, illustrated or otherwise, bearing on "arionauts," and, as far as I am aware, no arrangements have been made or contemplated for any articles or sketches bearing on the subject to appear in WORK. Your "idea that there must be ultimate success in the science" of aërial locomotion is a very old one. Birds have managed to fly ever since they existed, but the *genus homo* has not been able to do so. If you can show us how to fly, by all means send the Editor an article, which, of course, must be based on your personal experience, on approval.—D. D.

Colonial Patents.—A DABBLER (*Pontypridd*).—The words referred to in No. 35 should have been—"If we require protection in Great Britain for inventions communicated from the colonies or abroad, it will be marked A¹." If our correspondent looks back he will find that the oversight was duly explained in subsequent numbers. As regards obtaining protection in the colonies, he will certainly find that additional outlay must be incurred. In the Official Circular of Information, published by the Patent Office (Sec. 21), he will read, "Applications for colonial or foreign patents must be made to the Government of the colony or foreign state in which protection is desired. Most of the colonial and foreign patent laws may be seen in the free library of the Patent Office," Southampton Buildings, Chancery Lane, London, W.C.—C. C. C.

Wood for Chip Carving.—DELPH.—Lime wood is the best wood to practice the chip carving on, as it has a nice surface and is easy to draw on; the only objection to it is its light colour. Best American walnut does very nicely; the white wood which is used for little articles made for painting on, and sold at many fancy shops, is also suitable—in fact, any wood with a close grain can be used, and even a smooth piece of oak, although it is not so easy to work on. The tools mentioned in my article (WORK, June 6th) are the only ones required, but, if you wish to do larger work, the sizes of the tools can be increased: thus, instead of a ¼ in. spade a ½ in. one may be used, and so on with all the tools.—M. E. R.

Patent—Provisional Protection.—T. H. (*Wandsworth*) should refer to the article, "Taking out a Patent," No. 35, page 545, Vol. I. of WORK. He will there find answers to all his questions except the last. If he wishes to see the Specifications *at length*, he should go to the British Museum, where they are open to the public, free of cost, daily. But if, as is most probable, the *Abridgments* of Specifications will serve his turn, he can find them at some thirty different libraries in London. Possibly the Free Public Library, Great Smith Street, Westminster, will be as convenient for him as any.—C. C. C.

Telephone.—X. Y.—I have read your letter very carefully, and can sympathise with you in your praiseworthy desire to make and erect telephone stations at your mill. But really I cannot advise you to begin to make these instruments for several reasons. The first one is simply that you cannot do so without infringing upon the United Telephone Company's rights. And in the face of that it is not worth while taking up space in "Shop" stating the others. However, I will tell you what I would be inclined to do were I in your circumstances. I would make and erect a pair of "mechanical telephones," which would meet your requirements most excellently; and, besides, they would not be so difficult to construct, nor, by using them, would you be liable to prosecution by any company. You might think over this, and if you care to write again I will give you drawings and sizes and instructions for erecting. If you decide upon this, you may fill up your ground where you are putting your gas pipes, as this wire must be overhead.—W. D.

Telephone.—M. H. P. (*Glasgow*).—The answer to this query will no doubt be found in "Shop," for I have already given two or three different connections for telephones; I am sorry I have not my back numbers beside me, so therefore cannot quote the pages. Your sketch is not sufficiently plain to enable me to give a sketch of connections. Just turn up WORK and see if anything given there will suit; you will learn a lot by experimenting.—W. D.

Yacht.—ENGINEER (*Huddersfield*).—After being so long in one line of business, commencing afresh in another is a course requiring the most serious consideration. No doubt the work you mention is very creditable, more especially the crane, for few boys of seven would be able to handle so large a work. One thing, however, I must impress upon you: amateur work, executed necessarily in a disconnected way, so far as occupation upon it is concerned, is no preparation for the duties of a workshop. Attendance at the technical school is without doubt a very great assistance; but if you wish to learn the trade of an engineer or shipwright you must pass through the shops; this means serving an apprenticeship, and I suppose you do not wish to work as an "odd man." Starting at your age you would be under many disadvantages. You would, as far as pay is concerned, practically give up several years of your life; you will not learn as quickly as you would have done seven years back, and you will find it difficult to acquire a tradesmanlike way of handling the tools; you would be practically several years behind those of your own age were you to make a start amongst workmen brought up to the trade. If you are of an inventive turn of mind, your technical studies will tend to keep you clear of absurdities such as "Keeley motors" and perpetual motion machines, and you may, without entering the shops, obtain some benefit from your mechanical aptitude; but my advice is, follow your business for your living, and keep mechanics for your hobby.—F. C.

Electrical Machine.—T. C. (*Hetton Downs*).—An article on the construction of an electrical machine will appear very shortly.—ED.

Stereoscopic Slides.—T. C. (*Hetton Downs*).—For stereoscopic slides, apply to the London Stereoscopic Co., Cheapside, E.C., or Mr. Walter Tyler, Waterloo Bridge Road, S.E.—ED.

Improved Drawing Table.—H. H. W. (*Blackheath, S.E.*).—I am sorry to say that I do not know whether or not the Cincinnati makers of this table have any agent for its sale in London. I am inclined to think they have not, and that the best thing you could do would be to write direct to the manufacturers, and have one sent over to you. They will give you information as to prices, which I do not know. Unfortunately, there are many things of which I am ignorant, and this is one of them.—ED.

Decorated and Coloured Tin.—H. L. (*Berks*).—I do not know the process of decorating tin plates, but I am quite certain it would not pay you to do it yourself, especially as you only want a limited quantity. You would most likely be able to get it from the Decorated Tin Plate Company, Neath.—R. A.

Coloured Metal.—J. S. (*Ilkeston*).—See reply to H. L. above.—R. A.

Papier-Mâché.—RAPIER.—Apart from soaking in water to loosen the fibres, the reduction of paper to a pulp is a purely mechanical process, the machine used being akin to the "devil" used in paper-making. All shoddy materials are probably produced in much the same way. I believe that the boot buttons of which RAPIER speaks are made from scrap leather torn up and mixed with some cohesive substance. The French "factum," or shoddy leather, is produced in much the same way, but the cohesive material then used is more elastic. Of varnishes, RAPIER can read in our articles on Papier-mâché. Linseed oil hardens the papier-mâché, and makes it better resist damp. Unless thus soaked, the papier-mâché would also tear up under the plane and rag under the saw.—S. W.

Wood Letters for Outdoor Signs.—J. C. (*Birmingham*).—The best job that can be made

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of such work is to get ¾ in. yellow pine, or pitch pine, if you can get it very dry, 12 in. wide—13 ft. lengths—which should cost you under 4d. per foot super. It should be "*best*," not "best seconds," free from knots and shakes. Plane these over one side only; cut them into 12 in. lengths; then with a toothing plane, surface them as if for veneering. Prepare a flat surface, and, if possible, a press, to put them in; if you cannot get a press, obtain some heavy weights. Then with thin best Scotch glue, very hot, place two of these square pieces, previously warmed at a fire, face to face, but the *grain of one running the opposite way to the grain of the other*. Rub out all the glue you can, and put them under heavy pressure. Then warm two others in like manner, glue them quickly, and rub out, and so on. Let them remain twelve hours, then face them all on one side, square up one edge to work to, gauge them to your required thickness—viz., 1¼ in.—strap off the back with the jack-plane, smooth the face, but do not glass-paper it. Mix a small quantity of whiting—gilders' is the best—with warm water, say ½ lb. to the quart or three pints of water; rub it, smooth through your fingers so as to avoid all lumps, and then pour in about two spoonfuls of thin glue, and well mix by stirring. Prime the faces over with this wash, technically called "skeebo," let them dry thoroughly, and paper off with No. 1 and finish with No. 0, first across the grain and afterwards with it. You can then draw with a pencil as freely and as black as on paper. Having drawn your letters of any design you like, cut them out with a fret saw. Trim the soffits or edges up with a fine rasp, then with a file, and then with No. 1 glass-paper folded round your file. Then give the edges two coats of "skeebo," let each dry, and the faces a second coat, taking care that the "skeebo," is pretty warm whenever you use it. Now paper off again with No. 0 both edges and face, and, when quite smooth, give them all over edges and face a priming of gold size and boiled oil, thinned with turps or terebine, laid on as thinly as you can with a nicely half-worn sash-tool, and leave no brush marks. Let this set a day or two, if you can spare the time, but if you hang them up face to the wall, they will be hard enough in twelve hours for you to paint over with red lead priming at the back, so that you may give two coats at least to the backs whilst the faces and edges are getting thoroughly hard. Now proceed to gild the faces—and edges too, if you prefer it. I think myself, although it is a matter of taste, that they look far richer with the edges painted either vermilion or emerald green, and you gain an advantage by having paint instead of gilding on such parts of the edges, as water is likely to lie upon or lodge in after rain. If you decide to paint them, finish gilding the faces first, and then give the edges two coats of the colour you prefer. Then varnish the whole with colourless copal. These letters will never warp or break. You do not say whether you want to plant them on to a board or to hang them on strained wires. In the former case they should be screwed from the back of the board with screws that will not come through: two screws to a letter—one at top, the other at bottom. If to be hung on a wire, screw-eyes, to be had of any ironmonger, should be screwed into the backs, one at each side of the letter, 3 in. from the tops, and one at the same distance from the bottom, either in the centre, or as near it as you can. These eyes are about 2d. to 3d. per dozen, according to size, so if you prefer to use four instead of three, you can, but I think two at top and one at bottom would be sufficient for 12 in. letters. Having spaced your letters out on the wire, take some fine copper lapping wire, and pass it round the eye and the strained wire, and twist tight with the pliers, to prevent the letters sliding out of place.—J. W. H.

Rubber Shoes for Crutches.—J. M. (*Glasgow*).—Referring to my article on the above subject, Macintosh & Co.'s address is Cambridge Street, Manchester. They also have establishments in Glasgow: 176, Buchanan Street; Liverpool: 9, Chapel Street; and in London: 30, Fore Street, City. They state their price at 7s. 6d. per dozen, cash with order. See also my replies to A. S. (*Musselburgh*) and J. H. (*Redcar*).—J. W. H.

Glass Signs.—W. McC. (*Hull*) asks where he can best obtain the leaded glass signs such as one sees over the porticoes of London theatres. I recommend him to write to Mr. F. W. Sharp, Stained Glass Works, Windsor (a subscriber to WORK), or to Messrs. Jones & Firmin, 120, Blackfriars Road, S.E.—J. W. H.

Smudges in French Polishing.—E. L. T. (*Oporto*).—The fact that you are able to procure such excellent spirits ought, provided the gums are equally good, to be very much in your favour. The faults appear to be not in the materials, but in the finishing stages, for possibly you try to make the spirit rubber do what the polish rubber ought; in other words, if the polish rubber is used aright, no smudges or smears should be left for the spirit rubber to remove, only a semi-transparent film of oil. In removing this you may have used your spirit rubber too wet, so softening up the gums and, perchance, breaking up the surface. The fact that you get on all right with the filling and bodying-up proves this. When you take up the work again, and the grain appears full, with just a little over, gradually thin out your rubber with spirits, so using less polish and more spirits, till the rubber contains little else than spirit, using no more oil than is necessary to make the gums work easily, taking care that the rubber has a good flat face, and the rag covering is free from creases. Then try to finish without the aid of a spirit rubber (many an amateur fails at this point), but instead use a pad of clean soft rag, folded to resemble a polish rubber—*i.e.*, resembling a pear cut in half, not round as so often seen. Get this fairly damp with spirits, not merely a few drops on the surface, pass on to the work lightly at first, using pressure as it gets a little dried, rub away to your heart's content, and note the result. In re-polishing such as the wardrobe to which you refer, possibly you use the polish too thick; try the effect of using it thinner, and gradually thin out in the rubber as for new work. Many thanks for your kind appreciation of WORK. Am pleased to learn you turn its contents to such practical account, and shall be pleased to learn how you get on in this.—W. J. M.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

*** The Editor of WORK will be glad to see a greater spirit of co-operation shown by readers in replying to queries submitted in Section III. of "Shop." Many of these are somewhat difficult to answer, through lack of knowledge with regard to some, and lack of experience with regard to others. Editors, and those who work with them, are by no means omniscient, and are glad at times of a little outside help. Indeed, Section III. was started, that questions requiring special knowledge and experience might meet the eye of one or other of the thousands of readers of WORK who may possess either or both, and also to give readers something to do. So, readers, please hurry up with answers to all questions that are propounded in Section III.

Artificial Eyes.—F. T. (*London, N.*) writes:—"Would any reader kindly tell me if artificial eyes can be re-enamelled? If so, where can this be done?"

Graph that does not want Washing.—W. W. (*Chelsea*) wishes to hear of a graph of the kind indicated in the heading to this notice.

Artificial Water.—W. E. D. (*Hull*) writes:—"Will any reader say where I can obtain artificial water to put in a case with models of vessels? The price of same, and if it can be made? If so, how?"

Venetian Blinds.—ASPIRANT writes:—"There is an appliance used for rapidly painting these, called, I think, a 'boat.' I should be glad of instructions for making and using same."

Mandoline.—G. H. (*Walton-on-Thames*) is anxious to make a canoe-shaped bottom mandoline (Neapolitan is probably the name of it). He has seen the American inserted a few weeks back, and would be glad to have directions, etc., for making the kind of mandoline specified.

Canadian Toboggan.—W. F. (*Tunbridge Wells*) writes:—"I want to make a Canadian toboggan; can any reader supply a plan how to make it and what to make it of, or inform me where I can buy a plan?"

Plane Irons.—ONE IN DISTRESS writes:—"I am a joiner by trade, and in sharpening my plane irons, instead of getting an edge on them I rolled it off. I have lost the middle and third finger of my right hand, and I cannot put any strength on them. Can you tell me how to sharpen them? I have heard talk of irons that do not want sharpening or grinding; can any correspondent inform me of these?"

Harp.—H. W. P. (*Hull*) writes:—"I have a harp; will some kind reader give me the make of it? It has lost the right side plate that should have borne the maker's name; it has pedals, and the top is a basket of flowers instead of the round pattern at the top of the poll, the flowers partly covering the scroll. It has an Egyptian pattern running down each side of the belly. I should be pleased to know the make, and about the value of the instrument."

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Copying Apparatus.—A. A. (*Hawkesbury*) writes in reply to J. C. M. (*Bristol*) (see page 456, Vol. II.), and sends the following prices of a copying apparatus he uses:—Compo-lithograph, octavo size, 6s.; quarto, 11s. 6d.; foolscap, 14s.; folio, 20s.; brief, 25s. Cyclostyle, octavo, 21s.; quarto, 27s. 6d.; foolscap, 31s. 6d.; brief, 45s.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. G. (*Islington, N.*); W. W. H. (*Leyton*); M. T. (*Clapham, S.W.*); H. H. (*Finsbury, E.C.*); J. E. J. (*Huddersfield*); L. S. L. (*Kirkcaldy*); C. C. (*Rugby*); ÆON; G. E. B. (*Oswaldtwisle*); W. B. (*Derby*); F. E. F. (*London, W.*); W. P. (*Liverpool*); F. J. K. (*London, W.*); J. T. D. (*Nottingham*); W. G. (*Dudley*); H. C. (*Wednesbury*); J. J. O. (*Charlton*); J. P. (*Devonport*); A. F. (*London, S.E.*); W. E. G. (*Sutton*); J. W. (*Old Charlton*); EXPERIMENT; H. J. T. (*Cambridge*); A. W. W. (*Baltinglass*); NAD NROGDUG; A HANDICRAFTSWOMAN; W. H. C. (*Ilkeston*); J. C. (*Ealing Dean*); E. A. P. (*Tullow*); J. C. E. (*Whitchurch*); H. M. (*Melsham*); SCRIBER; A. E. L. (*Congleton*); C. J. D. A. (*Eastbourne*); J. B. (*Dundee*); CYMRO DEWI; W. F. J. (*London, N.W.*); H. W. (*Strabane*); AMATEUR; H. C. (*Maidstone*); F. P. (*Dover*); J. C. (*Plymouth*); A. P. H. (*Bedminster*); J. G. B. (*Bearsden*); ONE IN TROUBLE; GLASGOW; E. A. (*Dublin*); M. D. C. (*Wavertree*); W. H. P. (*Hornsey*); BUSY BEE; HOBBY; A. E. S. (*London, S.E.*); W. J. M. (*West Cowes*); G. C. B. (*Sutton*).

Trade Notes and Memoranda.

IN the report for 1889 of the Massachusetts Bureau of Statistics of Labour, returns are given from 1,615 different manufacturing establishments in the State in answer to the question, "What relation does the cost of labour bear to the cost of the product as it lies in the manufacturer's hands?" The percentage of wages to total cost of production in the various industries varies considerably. For example, in the following industries the percentage of wages is high—viz., clocks and watches, 77·06 per cent.; concrete walks, paving, etc., 71·22 per cent.; earthen plaster and stoneware, 66·09 per cent.; glass, 61·76 per cent.; models and patterns, 61·51 per cent.; brick, tiles, and sewer pipe, 56·71 per cent.; stone, 56·47 per cent.; fancy articles, 56·65 per cent.; crayons, pencils, crucibles, etc., 54·71 per cent.; salt, 52·23 per cent.; toys and games, 51·74 per cent.; and cooking, lighting, and heating apparatus, 51·24 per cent. Industries with low percentages of labour cost are:—chemical preparations, compounded, 9·27 per cent.; cordage and twine, 13·97 per cent.; fertilisers, 8·57 per cent.; food preparations, 12·44 per cent.; glue, isinglass, and starch, 14·97 per cent.; hair work (animal and human), 12·19 per cent.; leather, 14·38 per cent.; liquors, malt, distilled and fermented, 13·46 per cent.; oils and illuminating fluids, 5·92 per cent.; polishes and dressing, 11·10 per cent.; tallow candles, soap, and grease, 9 per cent. These are industries in which the raw material is itself a manufactured article, involving labour in its production. The bulk of the industries come between these two extremes of percentage of labour cost.

THE following is from the official paper sent out by the Emigrants' Information Office, 31, Broadway, Westminster, S.W.:—The annual Penny Handbooks—one on each colony, with maps—and the Emigration Statutes and Professional Handbooks, price 3d. each; the whole being also bound together, price 2s., issued by this office, show the present prospects of emigration to the colonies. Male and female emigrants for Queensland, Western Australia, and the Cape and Natal, may, in certain cases, obtain through friends or employers of labour in those colonies passages at reduced rates. Queensland also offers free and assisted passages to unmarried female servants, seamstresses, miners, navvies, and farm labourers, but for male labour there is just now no demand in the colony; and Western Australia offers assisted passages to farmers with capital. Farmers and others with capital are wanted in all parts; female servants in Canada and Australia, agricultural labourers in Australasia, and miners in Tasmania and New Zealand. There is no special demand for mechanics, except in some few localities, as for carpenters and bricklayers in Natal. The demand for mechanics in Cape Colony, to which attention was drawn last April, has since slackened, owing to the depression of the Transvaal Goldfields, and consequent return of large numbers of workmen to Cape Colony and Natal. Emigration to the Transvaal under present circumstances is not advised. It should be noted that it is too late in the year for men to go to Canada, unless they go to friends or have money enough to keep them through the winter.

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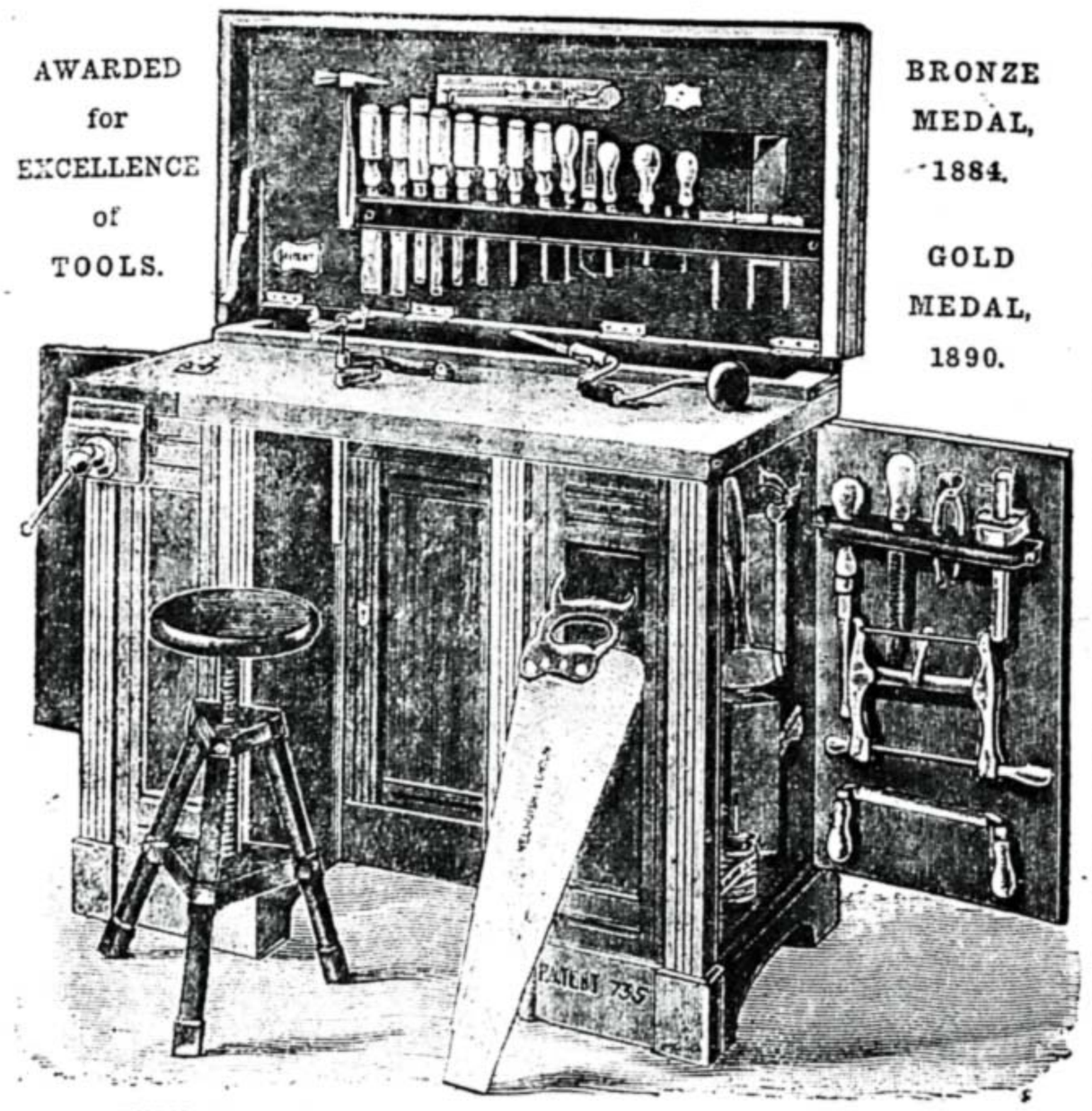

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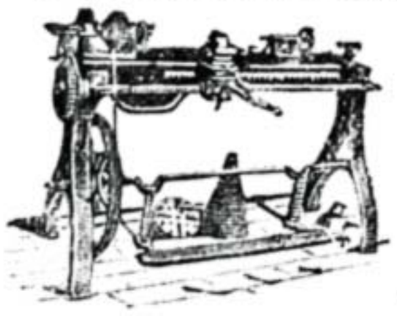

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